Hans Jürgen Holstein

HOMO CYBERNETICUS 5

A Macro-Sociological Framework

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HOMO CYBERNETICUS

VOLUME FIVE

A Macro-Sociological Framework

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Preface

Homo Cyberneticus comprises five volumes. All are relatively self-contained, but complement each other into one whole. The *first* volume is a synopsis of the simulation intentions and approach adopted by us; its tacit main question is: "How can we operationalize these intangibilities?" The *second* volume tackles this problem on the methodological level by trying to elaborate a systematic epistemology for dynamic causal modelling. Its conclusions support our initial 'hunch' that simulation is the optimal tool for dynamic causal modelling. Volume *Three* is therefore an investigation into our possibilities of constructing a simulation tool (a computer program) which will allow us to concentrate on our problem instead of on the computer. We do not wish to adapt our problem to the computer, but expect the computer to adapt to our problem instead, so to speak. Volume *Four* leaves all computer problems behind and asks again how we can simulate human behavior; the investigation is this time less superficial than in the explirative first volume. The *fifth* volume, finally, delineates a framework for rendering the causal simulation of societal macro-processes possible. It is simultaneously a first example of how the principles discussed in the earlier volumes can constrain, generate, and guide large-model concretizations.

The tackled task is vast, and although everyone agrees that it needs to be tackled, there seems to be a general suspicion that those who do it are charlatans and/or self-appointed prophets. It has hitherto been difficult to argue for *Homo Cyberneticus* properly because its 'point' lies in the linking together of a plurality of diverse fields of research;

and also because it contains relatively much 'New Think'. Especially the advocation of common-sense thinking at the expense of statistics has evoked skepsis and territoriality defences. Sociologists have thus downgraded it all to 'mere' computer science, while computer scientists have considered the simulation project oddly humanistic and too problem-oriented.

I was therefore very grateful when the Swedish Riksbank Tercentenary Fund dared to give financial support to my research in 1968. It has done so until this day.

The other important event was the foundation of the Computer Science Laboratory in Uppsala by Dr. Erik Sandewall and myself, as a 'home' for our up to then 'homeless' research projects, his being in the field of artificial intelligence, mine in socio-cybernetics. This symbiosis has, at least for my part, been immensely stimulating.

I thank also my collegues *Lennart Stålberg*, *Torgny Tholerus*, *Tore Risch*, and *René Reboh*, most sincerely for their participation and cooperation in this sociocybernetic venture during the past years.

Uppsala, in April 1974 H.J.H.

This volume has been written in very close collaboration. It is therefore impossible to distinguish the two authors' individual contributions, but there is a general tendency that methodological issues have been more influenced by the first author's conceptions, while the substantive material has been compiled by the second author.

Uppsala, in April 1974. H.J.H. & L.S.

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1. Introduction: Purposes and Basic Conceptions of this Volume

1.1. A 'Map of the Social World'

Volume 5 does not present a complete macromodel. We regard it rather as a 'problem map' with many white spots. Today's geographical maps are not the result of only a few explorers' expeditions (although some of them achieved more than others, of course), and equally little can one assume that the map of the 'social world' can be specified by merely a handful of researchers. But one could say that the world was round, or how the continents were positioned on the map, long before one knew where the sources of the Nile lay exactly or that Mount Everest was the highest peak on Earth. We believe similarly that our 'map' is of use for general orientation, and that it should be a research challenge. Despite their white spots were maps of *practical* use for navigation and facilitated thus further explorations. Humboldt, for instance, was in quite another position than Magalhães. Our 'map' will, in a similar fashion, facilitate our investigations into the nature of macro-social reality. We are fully aware that we as yet predominantly have compiled 'topographical' information, but we hope to be able to discover the 'rules' of the underlying generative processes from it, and thus to systematize such extensional information into a concise and more general intensional definition of the 'social world'.

1.2. Society - A System of Conflict Relationships

By and large, societal phenomena can be conceived of in terms of systems of conflict-generating mechanisms. In the course of time, societal processes happen to become more beneficial to certain agents and population categories rather than to others, and on all levels of sociological reality and in all societal realms there seem to exist general inequality-generating (and regenerating) mechanisms through which tensions and opposition emerge which generate social conflicts.

In general, we believe that those who assert the existence of stable equilibria of consensus and cooperation as 'normal' characteristics of social systems make a fundamental mistake. As a matter of fact, we wish equally much to emphasize the contrary conception which considers such stable states as quite problematic phenomena.

We may state that as soon there exist inequal distributions of the access to, and the control of, resources - material as well as immaterial - in a social context, certain agents or groups of agents can benefit more of the ongoing processes than others. This tends to make certain agents more influential than others, and this in turn implies a tendency that they become more relevant than others as targets of coalition-formation attempts and as partners in social exchange. On the other hand, this also makes them potentially more dangerous to other social agents and groups.

Through such general processes, *informal*, accidental, power structures tend to arise, and once they begin to stabilize, there is an increasing probab-

ility that formal structures will emerge. Further, once a specific pattern has become stabilized, it tends to be self-reinforcing through processes analogous to those indicated above, although most processes now become more explicit. Simultaneously, however, other social agents or groups may come to find it justified to rally around a core of agents who have mutual interests opposing those of the groups currently in power, and they may even be capable of achieving dominance over those currently in power.

When such changes of contextual dominance have occurred, the new incumbents of power will attempt to restructure social processes such that they become more beneficial to them than to the former power-holders. We consider it highly improbable, however, that any group in power ever will attempt really to spread their own influence to the masses of the people. For certain resources, such as knowledge and specialized skills, such redistributions are perhaps simply impossible.

Insofar as equalizing redistributions ever happen to take place, it seems almost inevitable that new differentiating structurings develop which replace the former. This seems unavoidable even in contexts where, for instance, economic equality is implemented such that no new economic inequality ever can develop again. Other differentiations will now have a chance to thrive instead and these can be as efficient as economic inequalities.

Although certain redistributions may become implemented which suspend the contemporary socioeconomical differentiations, they cannot permanently beat the general underlying self-generative inequality-reinforcing tendencies discussed above.

(It might even be revealed through historical studies that the formerly economically powerful elites' in, for instance, Western society have succeeded in maintaining and reinforcing their influence not so much *despite* but to a considerable extent *because of* the public interventions and redistributions undertaken there during the past century. Thus, despite certain progression of taxes and restrictions of formal privileges, the upper classes in so society can hardly be said to have suffered any considerable deteriorations of their socioeconomic influence. Several phenomena support this speculation:
Politically, the reformistic strategies implemented by socialist parties in Western Europe during the past 100 years may very well have stolen the wind from the more extreme left which propagates fundamental structural changes in society. At least part of German politics during the Bismarck era had such intentions (cf. Moore 1967, p 440ff). Cynically spoken, the clever ones in the upper classes may very well have supported demands for marginal inequality-reducing policies and thereby strengthened their own long-term probabilities of staying in economic power.

Economically, the increased prosperity of the mass might thus have been relatively more beneficial to the upper classes than continued extreme exploitation. Also the quite large stimulation of the economy undertaken by regimes in a Keynesian spirit might very well be far more beneficial to the upper classes than to those less well off. Stability and order are highly desirable to those who are favored by the currently given socioeconomic structure.)

We make no assumptions implying the existence of a great 'power elite' in C. Wright Mills' sense (cf. Mills 1956), and yet, to those less well off this inference must seem very likely. Thus, despite the case that there are often very intense conflicts of power in the top layers of society, they still take place within rather narrow circles, and even very radical regimes must now and then cooperate with their opponents simply in order to get anything done.

Our hitherto formulated conception is extremely simple and general, but we believe that variants of it are at work on all social-system levels. It lies in the very nature of the stabilizing processes we speak about that they will manifest themselves less often in systems that already are stabilized. "Stability" means here "formal control of mobility" (where "mobility", in turn, refers to *any* kind of change in socioeconomical influence). We do not mean to say that stability implies a low amount of mobility, merely that it is formally controlled. Most modern Western 'democracies' show even that it sufficies to have a stable frame (the sacrosanct parliamentary institution, namely), within which one can allow uncontrolled mobility.

Below in section 1.5. we shall discuss a specification of this conception to problems of societal development, notably to prehistorical morphogenesis of society and the State; before we do this, however, we shall discuss two other fundamentals. The rest of this Volume deals with the specification of our general conceptions to problems of contemporary societal phenomena.

(Relevant literature: Blau 1964; Buckley 1967; Dahrendorf 1961a, 1961b and 1968; Wiese 1933, Part II/Ch. 9.)

1.3. Problem-Solving Agents

As yet, we have only emphasized the rather self-organizing ('morphogenic') aspects of social processes. However, we wish to emphasize also the *adaptive and problem-solving* dimensions of social behavior.

We know from our own everyday and common-sense experience, as well as from studies in social psychology (cf. the discussions in Volume 4), that human beings almost incessantly become confronted with problems of uncertainty and choice in their everyday life, and that adaptive and problem-solving activities are typical characteristics of human behavior. Societal structures are typically highly complex and the resulting effects of choices are therefore rather difficult to predict; despite this, however, agents must continuously make choices which may have long-term repercussions on themselves in the future. The situation is rather similar, although perhaps even more pronounced, for macro-sociological agents. The problems on macro-sociological levels are also more serious because more people become directly affected by decisions in that field.

It should be emphasized that we by no means can accept the image of Rational Man, developed by classical economics and game theory (cf. March/Simon 1958). Were it so that agents knew all relevant facts, that they had clearcut numerical or other expressions of the payoffs of all conceivable alternatives of choice, and they could order all alternatives along one common dimension, as most decision theorists seem to presuppose, then, of course, there would be no need for decision

theorists or of scientists in general. However, the discomforting facts of reality simply refuse to conform to these assumptions and the immense efforts made by game theorists and other mathematical decision theorists are therefore unfortunately of rather limited use.

As an alternative, we emphasize a type of problem-solving activity which is based upon general heuristic thumb-rule criteria, similar to those found in political ideologies and party programs, or the profit-maximization principle found in economics. Our agents start with general ideals or purposes and general ideas about means to achieve them, but in the concrete situations, environmental constraints of economic, social, political, and cultural character delimit the ranges of available alternatives of action. The specific choices are then made with the general goals as criteria.

(Relevant literature: Blau 1964, March/Simon 1958.)

1.4. The Self-Interest Principle

Fundamental to both dimensions discussed so far is an assumption of an underlying *self-interest principle* which all social agents, be they human beings or groups, organizations or nations, are expected to use as a fundamental criterion in their choices among alternative courses of action. To us, this principle has almost a character of logical necessity. We assume that the world is populated not by saints, nor by monsters, but by everyday human beings, and therefore, it seems quite reasonable that people will prefer subjectively *good* alternatives to *bad* ones, and that they will, after they have ordered a set of alternatives, prefer the subset which is the best one available.

Similarly, we expect that groups will tend to *favor* their own positions rather than to *deteriorate* them, and that they will tend to enhance their own positions rather than that of their opponents. Similarly, for national behavior we expect that nations will tend to defend their own interests insofar as they are relatively autonomous, irrespectively of which the incumbents of power are, and that they will tend to defend themselves if vital national interests are violated by other nations.

There is a common misunderstanding about an alleged conflict between the self-interest principle and so-called altruistic behavior. Much of this confusion seems to stem from the image of extreme individualism (which was developed by Hobbes whose image of the Natural State was a chaotic "war of all against all"), and the criticism raised against it, mainly by Rosseau and the 'organical' tradition, where a completely contrary image was developed; obviously

both extremes are naïvely detached from reality. The assumption of a basic self-interest principle violates or excludes *by no means* the possibility of social life of a cooperative and consensual character. As a matter of fact, we are, as human beings, necessarily embedded in a social context from our first second of life, and the cooperation with others is a necessary means for people to implement their own purposes. Besides, if it makes one feel good to help another person, it is not quite altruistic to do so.

Another criticism seems more serious for our position at first sight. It is often argued that many people devote themselves to purposes, ideals and Utopias completely beyond their own personal interests. Science, for instance, is sometimes defined simply as a search for plain truth; Popper is perhaps the most prominent advocate of this position (cf. Popper 1969, p 114ff). Religious people even tend to go further, claiming that their ideals are quite contrary to the self-interest principle, and politically active people talk about commitments to ideological images and national interests. The self-interest principle, so runs the argument from Rosseau on, cannot be accepted because it fails to account for such phenomena. (Cf. Sabine 1968, for a thorough historical review.)

Granted that some people actually voluntarily engage themselves in activities with purposes totally beyond their own personal gains, it still remains to be explained, without becoming metaphysical, *why* they happen to do so. Obviously, human behavior has more facets than the mere satisfaction of acute basic physiological needs. One motive, for instance, seems to concern a need to become *oriented* in life

and in one's physical and social environment, and closely related is another need, namely to render phenomena encountered *explainable*. If we are correct, many aspects of cultural phenomena including those of the types discussed above, can be interpreted and explained in these terms. Consequently, devotions to external ideals and Utopias may very well be consistent with the self-interest principle. There are also other arguments, but this might suffice as an example.

It should be noted, however, that the principle can be differently emphasized in different situations. Thus, in situations which are extremely threatening to a person, his immediate, here-and-now needs necessarily override more utopian ideals, and behavior tends to manifest pure selfishness. On the other hand, in situations where one's basic needs are satisfied, there is greater scope for considerations of others' interests and commitments for distant ideals. (Once this has been said, however, certain phenomena - for instance, the fact that people could maintain their dignity even in such extreme contexts as the Nazi concentration camps - still remain almost unexplainable from an outsider's point of view.)

Compared to micro-sociological phenomena, where the application of this principle still is relatively unproblematic, its applicability is less self-evident when we are confronted with macro-sociological phenomena. The specification of national interests, for instance, is namely far more the result of political maneuvers than of 'objective' ethical considerations. But all agents *attempt* at least to impose their images of the good society (that is: structurations beneficial to themselves) as alleged

objective national interests. The resulting interest explications may thus be different from any formulation yielded by specific subgroups. The more hierarchically structured a society is, however, the closer will the explicit national interests correspond to the interests of those at the top.

(Relevant literature: Hearn 1971; a good collection of readings from Bentham on.)

1.5. Societal Morphogenesis

Basically, we wish to reconstruct social mechanisms which generate macro-level societal phenomena. Our discussions so far refer to such very fundamental mechanisms which we believe are at work on all levels of social reality.

As a heuristic application, we may consider how they might have been working through the early development of human society. As is well known, there exists almost no information concerning prehistory, and we must therefore be rather speculative regarding these periods. However, since we believe that our general mechanisms are reasonable, they should be applicable also to these phenomena. We suggest therefore that the early stages of societal development might look something like this:

a. Given is a set of *regions* comprising natural territories with fuzzy boundaries. Each region is populated with people which have the same language and ethnicity. People belong to *families* which are associated to *clans*, and they spend almost their entire day on attempts to supply their basic needs.

b. Families are spatially agglomerated into *communities* which not necessarily represent only one clan.

c. Quite early, *cooperative* relationships tend to be generated. Capture and killing in *hunting* often requires cooperation. Those who happen to be stronger than others, those who can use their weapons better, and perhaps those who are smarter in planning might be considered as contributing more to the common good than ordinary men. In return, they may be granted the finest flesh and even somewhat bigger

shares than others, and they may even take an informal command over the teams.

Analogously, although all families are basically materially self-sufficient, certain people may happen to be more skilled in certain tasks than others. If others ask them to do the job in their place, they may successively become specialists and begin to work as full-time artisans. Thus, after some generations, a primitive *division of work* originates; initially it is quite amorphous but it tends to become successively more pronounced. Through their nature, certain tasks require quite much equipment, long experience and great skills of their practicians, stone-cutting, smithery, wheel-making and construction are typically such fields, and for such tasks, specialization seems very likely.

Similar processes which generate differentiations among people seem to be at work also in agriculture. Also in systems run on a collective basis, certain persons may happen to be stronger, more skilled, etc., than others, and they may be granted greater shares of annual yields than the others. Similarly, where cultivation is family-based, certain families happen to obtain greater yields than others, and through accumulations of buffer stocks they come in potentially better positions as partners to artisans and in case famine should occur.

Furthermore, different qualities of land tends to enhance specialization of cultivation; surplus yields may be exchanged for goods and services needed, and in this process certain agents almost inevitably happen to profit more than others; this is especially true for merchants.

Summarizing this stage, we may say that rather amorphous informal *organization* tends to develop, where certain families happen to be somewhat more influential than others, slightly richer than others, etc. They become more attractive than others as partners of cooperation and marriage, and the total community structure tends to agglomerate around these families.

One crucial collective task also concerns the *regulation* of internal conflicts. Generally, the community organization is too fragile to stand the tensions generated by internal conflicts. Furthermore, because certain tasks are collective, they must be decided on a collective basis. Formal community meetings are eventually established where recurrent tasks of such common interests are to be settled.

d. External *physical threats* from isolated people in the woods, and organized groups from other communities are important cohesion-generating factors. Conflicts can concern the control of boundary lands between two areas, there can be blood feuds, pillage, or rape.

e. Now and then, one community happens to be somewhat stronger than others (perhaps only due to differences in numerical size). The former group may then be able to defeat its enemies one after the other. Sometimes, they simply kill all enemies except for some young people which can be taken as slaves. In other cases, however, they may take a *tribute* instead as compensation for their losses. The powerful communities become more powerful in both cases, while the losers become even weaker. Slaves may constitute the very first layer which

has an explicitly subordinated position, while the original members of the powerful community constitute the layer of 'free men'.

f. Heavy tributes may impoverish the weaker community for quite long periods, especially if the winning community makes the payments recurrent. They can, for instance, demand that all young men of the subordinated areas must serve as warriors. In return, the weaker communities may be granted protection in case of war. Collection of tributes becomes institutionalized, and a specialized group of warriors directly subordinated to the leaders to the powerful ('core') community arises and becomes organized. Within the controlled territory, these warriors become the ultimate maintainers of law and order, and externally they take part in warfare.

g. Inequalities of power gradually become *accentuated* and the top leadership of the 'core' community tend to form a well-defined, closed circle.By virtue of their control of the repressive forces, they can maintain control of the whole territory.

h. Through territorial expansions, the community can grow in size. New land areas can be exploited for agricultural production and extraction of minerals and wood, and a greater population pool becomes available for compulsory warrior recruitment and enslavement.

Topological and linguistic boundaries - they tend to be strongly correlated - represent 'natural' demarcations for territorial expansion. However, the needs for food, warriors, slaves and markets may be so great that these boundaries are surmounted.

Gradually, the original members of the core community crystallize as an upper class of independent men in leading positions. Below them, other free men constitute an intermediary layer of artisans, traders, small-industry entrepreneurs and landowners. At the lower end, there is now a layer of petty peasants and serfs, soldiers and slaves; and a 'Lumpenproletariat' of poor people constitutes a bottom layer.

i. As the complex community expands, it also assumes responsibility for many collective tasks which were formerly accomplished by the local communities such as taxation, control of trade and customs, external defence, internal repression, and civil legislation.

Through the numerical increase of such tasks, plus certain others which become possible through continued taxation - notably the making of communication routes, harbours, fortifications; construction of public buildings, city planning, etc. - a set of people in the top leadership become specialized in dealing with different subareas; we can discern the vague outlines of an administrative apparatus.

j. Gradually, the administration expands and becomes a unit that no longer maintains itself simply due to the persons who participate in it; a formal *bureaucracy* becomes established.

k. Those who are in leading positions can remain there only by virtue of support from sufficiently great subgroups of collaborators. The necessary size of these groups depends upon the actual political situation. In contexts where most people show passive obedience and opposing forces are

internally split, a rather small leading elite may retain control through the use of rather 'soft' means. However, if opposing forces are organized into one coalition with power aspirations, much greater support is needed in order to retain control. Besides, physical force must often also be employed in order to control such opponents.

1. The control of means for physical repression represents a decisive short-term warrant for being albe to maintain existing constellations or to change them in a certain way, but long-term societal changes can upset any fixed plans.

Technological change, trade and industrialization represent fundamental forces through which societal structures undergo profound transitions over time. Formerly powerless groups may become economically important, while former leaders may lose their positions. The more profound societal changes are, the more deeply will also political structures tend to change. As new population layers assume power, namely, they tend to introduce policies which are beneficial to themselves and try to bring earlier privileges to an end.

Furthermore, the more concentrated in time these processes are, the less likely is it that those currently in power will succeed in maintaining control of them, and the greater is therefore the likelihood of political revolutions. From this stage on, processes tend to be far less logically necessary than before, and history as we know it seems to start somewhere at this level.

(Relevant literature: Lenski 1966; Moore 1967; Engels 1891 represents the classical Marxist text.)

1.6. Major Features of Our Model

We attempt to outline the construction of an integrated large-scale model of societal phenomena. It has thus certain similarities with works belonging to the classical traditions of social philosophy and sociology (cf. Martindale 1960, for a recent quite thorough historical review).

Whenever we attempt to make detailed descriptions, comprehensive models tend to become rather complex. As an illustration, consider the field of econometrics. There, few of the models used as descriptions of, for instance, the American economy utilize less than 100 variables and relationships (cf. Naylor 1971, where several of the models used for short-term detailed predictions of the American economy are reviewed), and they seem still to have a rather weak predictive power; data must be updated, for instance, each quarter or twice a year in order to maintain the models within reasonable fit with reality.

Deterministic causal models can seem simpler than those which employ statistical regression values, but models describing societal reality in total must obviously account for a greater number of phenomena than economic models. Many relationships in the sociological realm seem furthermore to be much more intricate than economic phenomena. Thus, even if we impose several simplifying assumptions, it seems unavoidable that models accounting for societal phenomena in total must be very complex.

Sociologists in general tend to have a fear of complexity; they tend to be far more attracted by mere verbalizations or theorizing in terms of one

or a few core variables which for some reason are considered crucial. Of course, sociology can continue with this tradition, and in certain respects it is a necessary heuristic prerequisite for fruitful theoretical innovations. As a complement, however, we wish to emphasize the need for complex, integrated models.

1.6.1. The Basic Elements of an Integrated Model

Any comprehensive model of societal phenomena should be able to integrate at least the following:

The production, distribution, consumption and reproduction of material goods and services; for short: *Economic phenomena.*

The structuring of the population into age and sex categories and its changes through migration, fertility and mortality; family networks and kinship structures and their temporal changes through marriages and divorces; for short: *Demographic phenomena.*

Educational opportunities and choices, occupational choices and the associated changes of social and physical locations of the population; for short: *Social mobility.*

Problems of relationships in the labor market with conflicts of interest between employers and personnel, problems of work and unemployment; collective bargaining and interest organization; for short: *Labor-market phenomena.*

Problems of conformity and deviance and how they are generated; for short: *Social Control.*

Problems of social class-formation, class organization, mobilization and class consciousness; in short: *Stratification phenomena.*

Phenomena in the political realm, including political parties, ideologies and interest formation; political elections and party recruitment; mass media and public opinion; in short: *Political phenomena.*

Phenomena of governmental activities and public administration; in short: *Bureaucratic phenomena.*

Cultural phenomena in a wide sense, comprising religious movements, theater, literature and art, musical activities, order fellowships, etc.

Obviously, there are several boundary phenomena both in the Nature (climatological factors, for instance), and on individual levels, which influence the phenomena outlined here. We consider it legitimate, however, to make a halt here in order to arrive at a preliminary mapping of our problem field. In the subsequent sections, we shall indicate the major content of each subfield.

Like in Volume 4, we shall emphasize the integrative aspects of this problem field. Man is a unity and so is society, and we consider the contemporary bifurcations of the social sciences not only dissatisfactory, but devastating if we ever shall attempt to arrive at a unified sociology.

2. Multi-Levelled Causal Simulation Modelling of Socio-Economic Systems

Contemporary attempts at computer simulating socio-economic phenomenatend to be rather limited in scope, namely either predominantly macro-economical, or micro-economical, or socio-political, but very rarely combining two or three of these realms. These models are usually numerical, having the form of sets of equations. Practically all are based upon aggregate data and used for predictive purposes; the *explanation* of phenomena is not their concern.(Cf. Dutton-Starbuck 1971; Forrester 1961, 1969, 1971; Gunzenhäuser 1968, pp 127-144; Naylor 1968.)

Why are there so few computer models that combine the three above-mentioned realms? Is it because their predictive power has been found not to increase sufficiently to justify such combinations? Or is it because only few single-model users could afford the additional costs and labor of continuously collecting the data required for valuating a much larger model? And are social scientists quite uninterested in the explanatory potentials inherent in multi-levelled simulations? Or have integration attempts surrendered to the difficulty of the task?

At least from the sociologist's point of view is such a segregation dissatisfactory. Reliable sociological data are increasingly difficult to obtain, quite in contrast to the trend in economics. Social micro-processes accumulate into the economic givens, but if economical data are relatively easy to obtain, it makes little sense to try to infer them from the underlying sociological level, at least not

if one does not have explanatory ambitions. But fruitful inferences from the economic to the sociological level could be made both easily and inexpensively.

It is a common objection against detailed causal modelling that it is impossible to simulate millions of persons as individuals. Memories could not suffice, computer times would be too costly, we could not supply the empirical data necessary to valuate such models, and such models would also be as unsurveillable as reality itself ('Bonini's paradox') and therefore impossible to handle and to cope with. Abstract models which focus upon only a few variables and their interrelationships are therefore claimed to be a necessity; we call such models 'behavior models' (cf. Volume 2, chapter 5).

One obtains results from behavior models, of course, but what do we know about their validities? What is the use of predictions if we do not know to what extent they are trustworthy? That is why we ask ourselves how we can validate behavior models. It is not sufficient to prove that their results are logically consistent with the premises, and neither does it suffice to point to the fact that a given model's predictions have been adequate in the past. To reason in this manner means that we regard the behavior model as a material implication; the truth value or validity of this implication is exclusively dependent on the truth value of the consequence and completely independent of the validity of the premises. Few would surely wish to take this extreme point of view, most would rather agree that the use of a model is only justified if the truth of the consequent depends on the validity of the model. Because one might otherwise as well generate

random results.

This means that we must try to validate the assumed premises without making reference to the truth values of conclusions drawn from them. We must instead seek to derive the premises from assumptions which we believe to be more obviously valid. But the same argumentation is applicable to the new assumptions, and we are thus recursively led to the point where our assumptions are such basic constituents of our common-sense world view which we cannot imagine to reject.

Complete validation implies thus reverse axiomatization. We know that social reality has not yet been given an axiomatic description, and high-level premises can therefore not simply connect to such a description; they float in the air as yet. In other words: Complete validation of a behavior model requires its transformation into a determinate causal model. Validation must be based upon an explanatory model, and we seek explanatory models for the sole purpose of validating other models.

Let us now look at the problem from a less theoretical and more practical point of view. It is indeed plausible to assume that a model which consistently has yielded correct predictions in the past most probably also will predict correctly the next time. But few social models at least, are as reliable and well-tested. Social reality changes fast nowadays, and macro-social models need regularly be put 'back on the track' by fresh empirical data.

Comprehensive causal models can, in case they are adequate, predict reality changes and adapt to them. They need therefore be put back on the track less

often. This is a way to use a model's validity and comprehensiveness for reducing modelling costs.

Another reason for causal modelling is that they are less 'distorted' than analytical models; models constructed by different persons can therefore more often and more easily be coupled. Knowledge accumulation is therefore easier to achieve with causal models.

And finally: A number of futurological studies, to take a popular example, have pointed out that mankind approaches doom's day unless certain trends are changed. But it is not always obvious from the fact that a particular parameter value must be reduced from 0.9, for instance, to 0.5 what we are to change in our everyday lives in order to achieve the necessary adaptation. Causal models are necessary here for enabling us to plan our actions, irrespective of whether the predictions are correct. The prediction model has only been able to indicate goal-achievement criteria.

But the question remains how the simulation of very large deterministic causal models is to be made possible. We have tried ourselves for several years and naturally met serious difficulties, but we are at present engaged in the implementation of a model, the principles of which we shall describe in short in the following. Its details are specified in the consequent chapters.

2.1. On the Choice of Decision Units

Although we regard persons as the 'real' agents in our system, we allow the focus to shift from the person level to aggregate levels of different orders. Groups interact thus according to their own behavior rules, formal organizations according to theirs, et cetera. These behavior rules make reference to the aggregates' properties, of course. These properties have not been ascribed by us *a priori*, but are instead derived from detailed simulation of the aggregate. They are what is called 'emergent' properties.

When simulating very large systems we can always distinguish classes of similar subsystems. It is in these cases unnecessary, if not impossible, to compute the 'emergent' properties of each and every one of the subsystems. Since they are similar it is sufficient to micro-simulate a *representative sample* only, and then to let each of the remaining class members 'pick' a prototype from that sample in random fashion. When all agents on a certain level of aggregation thus have been assigned their properties, we can again let them interact and generate the next level's 'emergent' properties. Et cetera.

2.2. The Fuzziness of Data

a. Data on sociological phenomena have a peculiarly ambiguous character. Certain types of data are quite easily obtainable and they have a high numerical precision. Generally, these data are rather unstable, however. Consider, for instance, population statistics: although we quite easily can obtain exact values of population sizes, migration, fertility, mortality, and changes in marital status, these figures are valid only for specified time points and change almost continuously. Data on underlying processes which *generate* macro-sociological phenomena, however, tend to be fairly stable. Thus, while macro-sociological generalizations from one country to another often are invalid, we can make valid generalizations from individual-level data found in one context to another. These types of data, however, are generally more difficult to obtain and they tend to have lower precision.

b. Sociological data tend to be vague, and many-valued rather than single-valued. And our own simulations should be based upon rules of a similar character. We can achieve this through the use of 'fuzzy' sets and relationships. (The theoretical bases for these instruments are discussed in Volume 2, section 2.7.)

The practical argument behind the use of 'fuzziness' is simply that a simulation-system user shall be able to represent and use knowledge and beliefs regarding tendencies which indicate only vaguely what a relationship looks like. A user of the model shall thus be able to *verbally* indicate an approximative intensity and the computer will then randomly select a specific *numerical* intensity value

around a preprogrammed mean. We use the following verbal indicators and the corresponding numerical intensities:

Verbal indicator	Numerical intensity
all	100%
most	75%
many	66%
half-of	50%
several	33%
some	25%
few	10%
none	0%
the rest	100% less the sum of previous indications

Observe that in this context, *all* does not mean exactly 100%; nor does *none* imply exactly no cases at all.

Also category *boundaries* are fuzzy, such that in one simulation event 40% might have been generated from *half-of*, while in another the same figure might have been derived from *several*.

If we wish to differentiate further, we can make several successive steps. We may, for instance, say that *few* of the members in an industrialized system are occupied in the primary sector. Of these, *most* are working in farming. Of these, perhaps *half-of* are independent farmers, while *several* are tenants and *none* are landlords; *the rest* are farm-workers and maids. Et cetera; we may continue with similar differentiations in as many steps as we wish.

As long as we are interested in the simulation of *abstract* societal phenomena and not in the mere representation of concrete instances thereof, the use of fuzzy data and relationships is a powerful instrument. Using only vague tendency statements, we may regulate the basic morphology of the society which we wish to simulate and then let the computer generate its definite details. Similarly, we may express dynamic rules in equally vague propositions. We may procede analogously for specific submodels and need not bother with the frustrating task of inventing exact percentage values.

2.3. Filtering Processes

When simulating decision-making procedures, we must consider boundary constraints which delimit the number of alternatives evoked for different agents. When agents make different decisions in situations with similar sets of alternatives, we tend to explain the phenomena by reference to differences in attitudes, ideological commitments, major goals, prejudices, information, etc. Some differences are obvious; varying access to and/or control of material and economic resources, for instance; other ones, however, are more problematic.

Consider, for instance, the situation of a conservative government which comes into power. Nobody would expect that this government should give high priority to nationalization of trade, industry, and banking. A communist government, however, might do this as its very first step. Such differences can be explained only in terms of ideological commitments.

Once we characterize decision-making agents, we must attempt to indicate which *criteria* they use in situations of choice. Generally, when we simulate societal phenomena, we are not interested in *individual* problem-solving but rather in *collective* problem solving in wider contexts, such as interest organizations and political parties. Abstract decision-making criteria are there often explicitly formulated in general programs and ideologies, and in public statements. As such, they have a role of *constraining boundary conditions* concerning which alternatives are considered relevant. Thus, insofar as we can apperceive invariances in preferences for different policies, we can make use of such information.

3. The Morphology

Simulations of societal phenomena must start with the generation of a specified 'morphology'. A morphology represents a momentary, here-and-now total description of a system's characteristics at one given point of time. Once the generation has been made, the morphology can be used as an initial state of the system, whose dynamics we attempt to simulate. Through the application of behavior rules to the system elements we can then trace the development of the system on different levels. levels.

We make thus a strict distinction between the *statics* of a system and its *dynamics*. The static aspects are represented by the morphology, the temporal, cross-sectional, multi-level description of the system; and the dynamic aspects are represented by the system's operation rules.

This distinction deserves some further attention. Although the mainstream of empirical sociology insists to be concerned with semi-causal theorizing, sociologists tend to base their analyses upon cross-sectional, morphological data. Characteristically, however, static descriptions can only reveal certain patterns of co-occurrences of variable values, but *never* show any causal links, only the *results* of such connections. Despite this, however, also the most advanced fields of empirical sociology, that is: causal analysis and path analysis, are almost exclusively concerned with theorizing based on cross-sectional static data. (Cf. Blalock 1971, the best available work in these fields, comprising 27 important papers.)

Only where we make longitudinal studies of system behavior can we expect to obtain reliable indicators of underlying causal links. (Ashby 1956, ch 5, even developed a separate methodology for situations where we have no *a priori* knowledge about internal states of a system and where thus only input and output data sequences are available; "Black Box Theory" is the name used for this approach.) Such studies are very rare in sociology, and researchers who attempt to make recurrent surveys of the same sampled persons consistently encounter enormous problems of data collection through great losses of responses in the second and third surveys. Furthermore, methods of analysis which have been developed for static data-structures cannot always safely be applied to the study of system dynamics.

We claim that the general principles outlined in 'Homo Cyberneticus' are flexible enough to permit simulations of societal phenomena of *any* stage of historical development hitherto known. As yet, however, we have happened to focus our attention upon problems of the simulation of phenomena prevalent in *contemporary* and *industrialized* societies. For that purpose, we have developed an outline of a standardized morphology-generating mechanism which can be used for the generation of any total, concrete modern society. (Cf. Volume 3, part IV.)

We hope to be able to construct *metamorphologies* in the future, which have the level of industrialization and certain other crucial variable complexes as parameters which may be manipulated as we generate different regions and total societies with different levels of development. (Cf. Myrdal 1968, pp 1843-1940, for the discussion of one suggestive list.)

3.1. The Morphology Generation

The technical details of the morphology-generation are discussed in Volume 3; we shall therefore leave these aspects aside here. Instead, we shall focus on some of its *general* characteristics.

First of all, we must be aware of the distinction between material and social contexts; the former are the physical settings of the latter. In social contexts we further distinguish contexts which have an everyday, continuous manifestation from those that become manifested only occasionally. Within the former category we distinguish demographic, economical, general social contexts, political contexts, and cultural contexts. To the latter category belong general social interactional contexts, cultural movements 'in the air', and also rather vague cultural traits which we may wish to use for the characterization of social systems.

When we generate a specific context, we always start with the *physical milieu* where we indicate the main characteristics of the physical setting. We thus indicate significant topological characteristics, ecological variables such as types of settlement and functional types of areas, but also the concrete material infrastructural elements, such as residential blocks, factories, transport terminals, administrative and cultural institutions, and supermarkets as well as local shops. Without these concrete facets of human environment, many aspects of social life would probably never manifest themselves in computer simulations.

Importantly, we can *steer* the generation exactly to the extent we consider appropriate; in one extreme, it can be done almost randomly; on the other hand, contexts can also be specified in all details beforehand. Whenever we wish to simulate processes in concrete, empirical contexts, we obviously must model them exactly beforehand, while if we are interested in the generation of a set of contexts of a particular *type*, the generation can be made at random by the computer in accordance with the relevant restrictions imposed.

We should also note that the *level of detail* of the specification can be varied according to the specific purposes of our simulations.

Once the physical context has been generated, we generate a *demographic context*, comprising the population living in the physical region, which works and has leisure activities there. The population is first of all structured according to *sex*, *age*, *family* and *kinship* networks. Furthermore, as a result of their positions in the economic context, they have general socioeconomical characteristics, such as education levels, income and wealth, fields of occupation, and their positions at work.

Obviously, if we should generate these two contexts completely independently, several problems would emerge. We might find, for instance, that we had regions in which we had no population (provided that we have numerical restrictions of the population size), or conversely, people that lived nowhere. Therefore, when we perform the successive generations, we must make certain restrictive adjustments of the contexts to each other such that there is a reasonable fit between them.

Ideally, the computer should be given information such that it could all by itself organize a whole database, composed of many meshed morphologies, from a single generation command. So far, we have not all means necessary for such implementations, but we hope to be able to obtain them quite soon.

Once the physical setting and the family and kinship structure of the demography have been generated and tentatively matched to each other, we can generate the economic morphology. Thus, we shall generate organizations concerned with the production of raw materials, the processing of goods, and service organizations. It is typical for all these organizations that they have concrete, material locations in the physical milieu, and that they have manifestations in the everyday processes in society. During the whole generation process, we encounter problems similar to those indicated above, and also here can we make as many restrictions and regulations of the process as we consider appropriate. Of course, also here serious matching problems are at hand.

In the following step we shall generate the social composition of the population through consideration of characteristics generated through the economic morphology.

Finally, we shall generate social contexts which not necessarily have any material locations, nor any everyday manifestations. These include, for instance, interest organizations and parties, informal interaction contexts, and certain cultural phenomena. Typically, these contexts have no direct physical locations but they are crucial for characterizations of regions and societies.

Ideally, we hope to be able also to generate economical structures automatically, using only quite vague regulating criteria, such as "the economy in this context is self-sufficient with respect to agricultural production, iron ore, and forestry; there is a surplus production of steel and household goods, and a lack of petrochemical industry".

At a more advanced stage, we may also supply vague attitudinal information that applies for rather fuzzy population categories, such as "catholics in the middle classes tend to be quite traditional concerning family policy, and rather authoritarian in politics".

Once we find appropriate means of handling such types of information, we can easily implement highly complex and multi-dimensional structures. We envisage a heuristic database monitor that can generate and manipulate such structures in accordance with submitted or standard rules of a 'social-world grammar'. This also implies a fusion of simulation approaches with symbolic ('syntactical') approaches on a static level. (Cf. the discussion of these two approaches in Volume 1, ch. 7.)

Next we shall consider the generation of each subfield separately.

3.2. The Subfields

The morphological specifications suggested here should be interpreted as *heuristic mappings* of the total problem field of societal phenomena and not as clearcut solutions of them. Furthermore, our suggestions are based upon criteria of *sociological* relevance and may therefore seem somewhat superficial to specialists in different subareas. Two points should be kept in mind, however, in defence of our framework. First, it is *modular*, which means that model parts can easily be replaced with improved versions; second, it is *incremental*, which means that the whole framework needs not be complete in all details before we begin to use it, and it can be augmented indefinitely while we use it.

We shall below indicate the major characteristics of the morphological structure of each subfield.

3.2.1. The Physical Setting

First, we make a *topological* specification of the physical environment. It is subdivided into *land areas* and *major water areas*. Land is further subdivided into mutually disjoint *regions* which are composed of *urbanized* and *rural* areas.

Each subarea is further subdivided according to *types of settlement* and main *types of activities*. Urbanized areas are thus subdivided into *metropolitan* areas, *middle-sized* urbanized areas, and *small towns*. Rural areas are subdivided into *cultured areas*, *natural areas*, and *special areas*, occupying quite large physical areas, notably airports, military installments, great prisons and supermarkets.

Within metropolitan areas we distinguish one *city core*, a set of satellite *suburbs*, some major *industrial areas*, and some *special areas*. Typically, metropolitan areas are commercial, political, and cultural centra for whole nations or major parts thereof. As a result, there is considerable concentration of activities representing such functions in the city core; there is a high density of high-rise residential settlement, and whole sectors of the city may have administrative functions. Typically, only special types of industry exist in the city core, notably printing, light mechanical industry and electronics, and food industry. In addition to extensive commercial and industrial areas, there are also *local* shops and artisan workshops in residential areas. Parks, squares, and railway stations, as well as hotels, restaurants, and cultural institution buildings are also represented.

Although metropolitan *suburbs* may be equally large as middle-sized autonomous urban areas, they typically tend to have only a *commercial center* and *not* the administrative, political, and cultural functions found in the autonomous areas. They tend otherwise to be quite similar in structure; both have high-rise residential blocks in the city, and varying types of settlement in their peripheries; both also tend to have industrial subareas.

Small towns differ from middle-sized areas not only in their sizes; they tend also to have a weaker concentration of many of the functions found in middle-sized areas. Typically, too, while middle-sized towns have low-rise residential areas as their surroundings, small towns tend to have agricultural environments.

The concentration of industrial areas to urban districts is very typical, and we shall generate industrial areas comprising sets of industrial subareas which have mill-complexes for processing industry, terminals for transports and warehouses.

Rural cultivated areas typically comprise a set of *villages*, isolated *farmsteads* and *small farms*, and sometimes an *estate* or a *manor*. Rural natural areas have *forests*, *grasslands*, and some include *lakes*. Each village, in turn, has a set of farmsteads and small farms, some village houses where artisans live and have their workshops, some small shops, and some 'special houses', notably a school building and often a church, as well as houses where those who work there live. Estates typically comprise a core and associated scattered small farms on the estate grounds; each manor is typically composed of at least two estates.

We shall make specifications of the physical setting down to the level of *individual apartments* and separate *one-family houses* for residential subcontexts. Similarly, we shall specify industrial, administrative and special subareas down to the level of *individual workplaces*, that is: spatially quite well-demarcated contexts wherein single individuals or groups of people execute functionally rather integrated tasks. This great level of detail might seem to go beyond the requirements for sociological simulations, but it has the great advantage of providing links for the association of the physical setting with separate households in the demographic context and with single work-groups in the economic context. Furthermore, it also provides a link to social psychology, as it represents the physical setting of family life and processes internal to the

organization, two of the major topics focused at in social psychology.

Also ergonomical and medical studies of concrete milieus are made possible within a morphology of such detail.

In order to generate subcontexts which are qualitatively more differentiated, we may associate *major physical characteristics* to them. Simulations of agricultural processes, for instance, seem to require indicators of land fertility, temperature and yield as important differentiating variables. Should we, on the other hand, focus our attention upon hunting tribes, we had to consider such phenomena as stocks of game of different sizes and perhaps also predator-prey processes in Nature. On the other extreme, if we should focus upon problems of futurology, we necessarily had to consider such phenomena as mineral deposits and energy sources, and their consumption rates. For a study of physical communication and transport processes, we perhaps had to consider such physical characteristics as differences between flat land, hills, mountains, valleys, gorges, etc., and for water routes we should have to find appropriate representations for navigability qualities, such as winds and floods, streights and falls.

One needs not be a Montesquieu in order to recognize the importance of the Natural environment for many processes of sociological development; but it is necessary to explicate the common-sense conceptions of their importance as boundary-setting phenomena for the variety of societal processes.

(Relevant literature: Dickinson 1964, Theodorson 1961)

3.2.2. Families and Kinship Networks

Family groups and kinship networks represent an important dimension of the demographic structure. Social scientists tend to agree that they are crucial for pure reproductive functions, but also for consumption processes and for the generation of social interactional patterns. Thus, we have multiple reason to include them in our general modelling.

When we attempt to generate such phenomena, we might procede according to two types of approaches: First, we might generate a total population at random and then associate people with each other through the use of probabilities found in demographic studies for numbers of children, age differences between parents, etc. Although it seems to be fully possible to do so, this approach is not especially elegant. As an alternative, we might instead start from scratch with the generation of families and kinship networks and then successively construct the total population; this is the type of approach that we have chosen.

Certain constraints are used which somewhat restrict the free play of associations. Thus, we have an upper limit of 100 years of age, we have two sexes which associate heterosexually, we impose restrictions in the age differences in married couples, we naturally utilize the fact that women have biological limits for pregnancy, we impose limits in the sizes of families and the age differences between children, and we impose rules of marriage, such that no man may marry a sister or first cousin. In order to be able to obey this last rule we thus must have at least three generations.

As a first step, we generate a person belonging to a child generation, he must be less than 20 years of age. Secondly, we generate his mother, who must be at least 18 years and at most 44 years older than him. On this level we also generate a father, who must be no more than five years younger or 10 years older than his wive.

In the third step, we go back to the child generation and perhaps generate brothers or sisters; as a maximum, we assume that couples rarely have more that four children. Then, we go back to the parental generation and generate *their* parents and then eventually the children of these. We generate grand-grandparental generations in similar fashion; its members may already be dead, however.

This process is relatively easy as long as we have only a few families and kinship networks. However, it becomes rather complex as we sucessively build up a total population. Despite this, however, it is simpler than the first approach suggested, because we work from the bottom and upwards and can maintain our control over the generation process.

Once the total population has become generated, we wish to indicate the status levels of households, their incomes and available wealth, and the fields of occupation of the breadwinners, including their positions at work. Obviously, we cannot easily generate these characterizations without having information about the economic structure of society, and therefore we must wait with it until we have made this other generation.

Eventually, we must also make matchings of families with residential areas, but since we believe that

these are dependent upon the economic structure, we must wait until the latter has been specified.

3.2.3. The Economy

a. We make first of all a distinction between the *primary*, *secondary* and *tertiary sectors* of the economy. The primary sector is defined to comprise those activities which concern the production, or perhaps more adequately spoken, the *extraction* of raw material from Nature, the secondary sector concern the *processing* of materials into goods and buildings, and the tertiary sector comprises activities that are *ancillary* to these two sectors, but also *controlling* activities, and activities in the *cultural* realms.

In the *primary sector* we thus have *agriculture*, including fishery, animal husbandry, hunting and forestry. A further subsector is *mining*, including stone, glass and cement mills, the extraction of natural *gas* and *petroleum*, and *power industry*.

The *secondary* sector comprises *manufacture* and *construction*. Some boundary problems exist which make the demarcation line between the sectors somewhat fuzzy. A peasant, for instance, who produces the tools necessary for his own farmstead is still a peasant and belongs to the primary sector, while an artisan who makes the same tools belongs to the secondary sector.

The *tertiary* sector comprises a very heterogeneous collection of activities. *Transportation* of physical goods, people, and messages is included here,

as well as *trade* and *service*. Also *social welfare*, *health*, and *education* belong to this sector. Major *controlling* subsectors are *finance*, *politics*, *public administration*, and forces of *physical control*, and finally *mass media*, *cultural institutions* and *idealistic organizations*.

b. Without specifying too much, we must at least make an outline of the main subgroups of the vast manufacture subsector. Seven principal branches may be identified:

b1. *Food, beverages, and tobacco industry*, representing a processing level very close to the raw material (at least before artificial colors and tastes were invented).

b2. *Textiles and leather industry* represents a slightly more advanced level. Usually, two stages may be differentiated: first the *production* stage where cloth and leather are made, and second the *processing* stage where the materials are used for the making of clothes, other textiles, and leather products.

b3. *Wood and paper industry* has two main branches with at least two stages. The *wood branch* has sawmills as the first stage, and joinery shops and furniture mills at the second; most sawmill products are also used directly in construction. The *paper branch* has wood pulp mills as the first stage and paper-mills as the second. Printing industry represents a third stage. (A *proteine-branch* ancillary to the second one can these days be added.)

b4. *Metal industry* represents perhaps the most important branch, and three stages can generally be distinguished. Closest to the raw material are *metalworks* which use ore and other material as input and yield semi-processed metals as output. At the second stage we can find at least four sub-stages, namely *machine* production, production of *semi-finished materials*, *tool* production, and production of *transport equipment*. At least machine production and the making of transport equipment require, in turn, at least one step of element production and one step of element combination, and these tend to be handled by different production departments or even different firms.

b5.*Electronical industry* is another, very advanced branch. Ordinary metalworks usually provide the semi-finished materials used in production, and we may distinguish at least two main sub-branches, namely production of electrical *machines*, and *electronical* production. At least the latter branch will be subdivided into element production and the composition of functional units.

b6. *Stone, glass, and cement industry* represents a branch which has a prime importance as producers of material for construction industry. A culturally interesting second step is represented by ceramics and fine glass industry.

b7. *Petrochemical industry*, finally, represents perhaps the technologically most advanced branch. Also here, several levels may be distinguished. First, quite close to the raw material level is the *refinery*; second, there are industries using these products for the making of plastics, color, et cetera; and third, there are industries utilizing the

output from the second step. These, however, belong to the categories we have indicated above, for instance, textile industry, electronical industry, construction, et cetera.

c. Considering now the *total labor force and its distribution*, the following fuzzy proportions seem to account fairly well for its structure in most Western societies:

Of the total labor-force in occupation, *few* are employed in the primary sector, *half-of* in the tertiary sector, and *the rest* in the secondary sector. Of those engaged in the *primary* sector, *most* are engaged in agriculture and forestry, *few* in power industry, and *the rest* in mining. Of those engaged in the *secondary* sector, *most* are employed in manufacture and *the rest* in construction. For those engaged in the *tertiary* sector, finally, we must make a further subdivision: *several* are engaged in transport, trade and service; *several* are engaged also in welfare, health, and education and research; *some* are engaged in finance, politics and administration and physical control, and *the rest* in mass media, cultural institutions and idealistic organizations.

Of the first subcategory of the tertiary sector, *half-of* are engaged in transport (including postal service and telephone), *few* are engaged in 'pure' service (hotel and restaurant personnel), and *the rest* in trade. Of those engaged in the second subcategory, *half-of* are engaged in education and research, *few* in welfare, and *the rest* in health. Of those engaged in the third subcategory, *some* are engaged in administration, and *some* in physical control, *few* in politics, and *few* in finance. Finally, in the fourth subcategory, *half-of* work in

mass media(radio-tv, newspapers, publishing houses) and *the rest* in other categories.

Typically, socioeconomic development processes in a society can be indicated through changes in the total distribution of the labor force on different sectors and subcategories. A recent trend in the highly industrialized nations have been a consistent decrease of the primary sector, especially of agriculture, associated with only slight increases of the secondary sector (in fact, now also this sector seems to be diminishing at least in Sweden). The great expansion has occurred in the tertiary sector.

We can hardly make stricter specifications than these, because there are very great local variations in the structural composition of the econome; important factors which account for such variations are the supplies of raw material and transportation means in a nation.

3.3. Toward a General Morphology of Organizations

Students of formal organizations have suggested several typological approaches for the comparative study of organizations, and the different classifications are intended to account for major differences in internal structure and operations. Etzioni, for instance, suggests a differentiation according to types of internal control and makes a distinction between 'normative', 'utilitarian', and 'coercive' types of organizations (cf. Etzioni 1961). Blau and Scott similarly discuss the classification problem in their standard work (Blau and Scott 1963, ch 2), and they suggest a *cui bono* criterion (that is: whose interests are the organizational operations expected to serve). They distinguish (a) mutual-benefit organizations; f.i., unions and idealistic organizations; (b) business organizations; (c) service organizations, aimed at serving a clientele; f.i., hospitals; and (d) commonwealth organizations, which have the purpose of serving the public in common; f.i., the police (*sic!*). Due to the different interests served, different objectives and thus different types of problems become generated, and their solutions may require different types of structural arrangements (*ibid.* p 45ff, p 224). Despite its quite suggestive character, however, this typology is quite arbitrary, and its empirical applicability seems questionable. The perspective of major societal cleavages and class conflicts becomes blurred in this scheme, and we might, for instance, argue that police forces equally often serve the interests of small power elites as they serve the public at large.

We believe that, at least for most everyday phenomena, the generally accepted sectorial subdivisions

used in section 3.2.3. are no worse than the typologies suggested above. Our approach has furthermore the advantage of corresponding to differentiations employed in public statistics. Instead, we shall rather focus upon a *structural* dimension, namely differences in the complexity of internal structures.

3.3.1. Complexity versus Organizational Size

We suggest that organizations can be classified into at least five complexity classes and that the level of complexity is weakly correlated with the size of the organization. As usual, we assume fuzzy relationships.

a. At the simplest level, we speak of *mini-organizations*, which are run by one or very few persons and where there are very weak formalizations of activities; anybody can do what the other does. These can hardly have more than 8-10 people in work which seems to be an upper limit for communication in freely interacting groups.(Cf. Berelson/Steiner, p 358f.)

b. Next, we speak of *small organizations*, typically having a weak division of labor, but formal employment contracts, and relations of subordination under a chief. The owner/leader has *coordinative* functions and takes the administrative and accounting tasks, possibly with some assistance of a clerk and/or a secretary. The organization typically has an *operative core activity* (and thus a principal set of tasks), which is executed by at least one workgroup (and at most ten workgroups), occupying a specific physical *workstation* and having an integrated task-set. In the case they have two or more work groups, organizations tend to have an

intermediary group coordinator. Each workgroup, in turn, generally has one man who has coordinative responsibility within the group, who obtains orders on behalf of the group and who makes certain decisions concerning its internal division of labor. We generally also can discern a workgroup which is concerned with *ancillary activities* (in production firms, for instance, an *inventory group* generally has such tasks).

c. Moving upwards in complexity, we speak of *medium-size organizations* which have more specialized functions, like separate workstations for different administrative routines (accounting, purchase, sales, etc.), and where coordination, operation and ancillary activities are formally organized into *departments* comprising specialized subgroups.

d. *Large organizations* represent a higher order of complexity with separate *divisions* having responsibility for the separate sections, within which *departments* and *groups* are units of further specialization. Large firms may be organized around a complex production output, with semi-autonomous divisions operating with great freedom.

e. We finally speak of *organization complexes*, which are geographically decentralized and which comprise several subordinated firms. They further tend to have their administrative units located in metropolitan areas, or with one of the subordinated units ("the mother firm").

Obviously, there can be no zero correlation between organizational size and complexity; no one-man firm can, for instance, be medium-sized; nor can firms with thousands of people employed have the minifirm

structure. And yet, there are many quite large firms which have very simple structures, and perhaps even more frequent in these days, many quite small firms have strictly specified bureaucratic patterns.

Workstations represent the basic contexts for individuals in all types of organizations, be they agricultural, processing or service-oriented, military or cultural. They represent the links which connect the economic structure with the physical milieu, and through which we also have an environmental setting for social-psychological processes.

3.3.2. Complexity versus Workpositions

Hierarchically, we may discern different levels of workpositions associated with different organizational units. In mini-organizations we have thus usually only a single level, but we may find an elected leader. Already in small organizations, however, we observe stricter differentiations, and the more complex the organization, the greater will the number of hierarchically ordered positions be.

We suggest the following preliminary distinction of levels in economic organizations:

Label	Workposition level
worker/clerk	1
group-head	2
foreman	2a
department-head	3
division-head/pres. (small org.)	4
company-head/pres. (medium org.)	5
president (large organization)	6
president (org. complex)	7

Historically, the internal differentiation in agriculture seems to have been perhaps even greater than that in contemporary economic organizations. Therefore we suggest the following levels for rural workpositions:

Label	Workposition level
maid	0a
farmhand, crofter	0b
small-holder	1
petty-tenant, farm-foreman	2
peasant	3
estate-administrator estate-tenant	4
estate-owner, manor-owner	5

The position 2a in the first table refers to a level intermediary between group-head and department-head. The zero-levels for maids, farmhands, and crofters, represent levels lower than those of ordinary industrial workers and small-holders.

These position values shall be used below as default indicators for levels of the wages and salaries received by different groups of people.

3.3.3. Workpositions versus Incomes

In order to generate the distributions of incomes in a region, we shall utilize the fact that they tend to be rather closely correlated with organizational positions. As a default rule, we shall use the base values in the table on the following page.

We should interpret these values as base levels of

income which are increased with 10% every decade that an employee has remained in his position. Thereby we make an account for the principle of seniority. This principle, however, is *not* applicable to self-employed categories, like peasants, artisans, etc. The table looks as follows:

Workposition level	Income in monetary units
0a	1500
0b	1700
1	2000
2	3000
2a	3500
3	4500
4	6750
5	10000
6	15000
7	22500

For *pensioners* over 65 years of age we use a 65% level of income of the sum in the position they had when they were active, with a minimum of 1400, and a maximum of 10000 monetary units.

Obviously, the income indications given here are *not* relevant for *voluntary* organizations, which otherwise may have quite similar structures. Usually, however, they have employed people in central administrative bureaus, and these employees obtain incomes in parity with administrative personnel in *medium-sized* organizations. Similar principles are relevant also for *unions* and *political parties*, although salaries there tend to be in parity with those for administrative personnel in *large* organizations.

3.3.4. Autonomy at Work

a. Typically, people working at different organizational levels tend to have different ranges of personal freedom at work. Certain administration theorists even have used this fact as a criterion for classifications of organizational tasks. Rehnman, for instance, according to Ramström (1963, p 30f), makes a fourfold classification of regulation strategies with *direct* regulation in one extreme, where desired behavior is explicitly defined in detail, and *goal* regulation in the other, where only abstract criteria for goal achievement are indicated. Roughly, these differences seem to correspond to differences in levels of work positions.

In search for adequate indicators of autonomy, it seems that *income levels* suit rather well.

b. We suggest the following fuzzy profile indicators as rough descriptions of the employment situation in each occupational field:

Autonomy level:	Occupational fields:					
	Agric.	mining	power	manuf.	constr.	transport
Indept	*	some	several	few	few	some
Semidept	most	*	*	*	*	*
Dependent	some	some	few	many	half-of	several

	Trade	service	welfare	health	educat.	finance
Indept	some	few	some	some	some	few
Semidept	*	*	*	*	*	*
Dependent	several	half-of	few	several	few	few

N.B. The table continues at the next page.

Autonomy level:	Occupational field:				
	Politics	admin.	phys.contr.	mass media	others
Indept	several	few	few	several	several
Semidept	*	*	*	*	*
Dependent	few	half-of	half-of	some	few

N.B. The "*" sign indicates "the rest".

3.3.5. Income versus Wealth

While income levels represent what people obtain here and now in payment for their everyday work, *wealth* represents what they have accumulated during their past by virtue of their 'economic history' and/or social background. Obviously, these two variables need not be correlated, although empirical relations actually exist. Thus, while you occasionally can find a worker who has happened to become a millionaire, it is far more common that a millionaire is a company director.

Like we did for income, we shall generate different classes of wealth, measured in terms of *property convertible into cash*. Because such estimations are very uncertain, we should use logarithmic representations which tend to cancel out minor differences. Property which is used as a means for obtaining regular and necessary incomes is obviously not convertible into cash by the proprietor as long as he has no alternative means of support. A factory-owner or a land-owning peasant may therefore be unable to exploit his formal wealth for private purposes.

3.3.6. Other Organizational Problems

The phenomena indicated so far represent at most a minimum set of boundary phenomena within which classical problems of organization theory can be studied. We shall only indicate a few crucial problem fields here.

a. The relationships between technology and social organization have been studied by, for instance, Woodward (1965), who found considerable differences in spans of control, numbers of hierarchical layers, and the proportional amount of staff personnel and professionals in organizations with different types of production and levels of mechanization . The impact of technology on the informal structure of the firm has been studied by, among others, Goldthorpe et. al. (1968). The types of information revealed by these and similar studies must of course be embedded into specialized submodels of industrial sociology.

b. The detailed relationships between growth, complexity, and bureaucratization of firms is crucial for a further development of this submodel. The problem field has been focused by, among others, Woodward (1965), Haire (1959), and Blau and Scott (1963).

c. Employee satisfaction at work, a classical theme in organization theory since March/Simon (1958), and the influence of this factor on productivity and turnover, must equally be studied in more detailed models. Argyle (1972) presents a good review of social-psychological problems and findings.

d. In a more detailed model, we should also attempt

to construct a typology of organizations more thoroughly developed than those hitherto suggested (cf. section 3.3.). The Blau/Scott perspective of different purposes which generate different types of problems could possibly be fruitfully improved for such purposes.

3.4. Population, the Physical Setting, and Social Structure

At this stage of morphology generation, we already have information concerning the material setting, family and kinship networks, and economic information such as fields of occupation and autonomy at work, income and wealth. Now we must make matchings of these three subsystems in order to obtain an integrated morphological specification.

Such matchings can be made through the use of special *overlap-rules* (cf. Volume 1, chapter 3) which indicate the physical locations of families and entities in the economic structure. Quite many studies in the 'ecological' tradition of sociology and social geography have focused on such problems, indicating the correlations between, for instance, income and wealth on one hand, and residential locations, on the other. Many studies have also revealed various invariances concerning the spatial distribution of residences of people working in specific industrial areas, etc. (Cf. Duncan et.al. 1961; Dickinson 1964; Theodorson 1961.)

Ideally, such matchings should be made quite automatically through successive parallel generations of the physical setting, the population living there, and the economic structure (and we hope to have the means for such implementations in a not too distant future).

Once we have generated these three basic subnetworks, we have information available concerning the locations of people, their ages and genders, their fields of occupation and levels of autonomy at work, and their incomes and wealths. When levels

of education have become implemented, we can generate populations with most of the standard background variables used in sociology, and we can easily generate rather complex descriptions of people without using *any* personality characteristics. And once we also include more personal data in our simulation, we can treat almost as complex descriptions as we wish. We shall be able to generate the basic elements of a total community structure in terms of very concrete operational entities.

We shall next focus upon a set of units which only partly overlap with those hitherto generated, namely unions and labor market organizations and parties, governments and public bureaucracies. We shall also reflect somewhat on social classes and cultural phenomena.

When we discuss societal phenomena, we shall refer to categories of people with similar characteristics. We are mainly interested in criteria which have great differentiating power with respect to the everyday behavior and experience of man. The *fields of occupational activity* and the *levels of autonomy at work* seem to be two such crucial dimensions. We conceive of *population categories* as rather seizable aggregates of people which are associated with similar positions in the space generated by these two variables.

Also the *incomes* and *wealths* of people obviously play a role for the determination of their everyday lives, and we may conceive of subcategories, or 'factions', within population categories relative to these additional variables. Obviously, also *sex* and *age* can be used for further differentiations, and we may thus generate subfactions through the

use of these variables. *Any* macro-level description variable can be used for further differentiations, but these six shall always be considered.

For many studies we can be expected to be interested only in how groupings of population categories differ from each other in their behavior. Instead of using different rules for each age category, f.i., we may be interested in generational differences, and instead of studying differences between all combinations of occupational fields and levels of autonomy, we may be interested only in differences between groups of population categories which have contradictory interests. Similarly, we may focus at differences between urban and rural areas instead of detailed differences between all areas. Such groupings can easily be made through our simulation modelling. One crucial grouping, namely into social classes, shall be separately discussed below in section 3.6.

3.5. Unions and the Labor Market

Unions represent a type of organization which only partly overlaps with those hitherto generated. They tend to be voluntary in character and work as agents advocating the interests of partners in the labor market. They have only a small proportion of full-time employed administrators and thus only insignificant representation in the economic morphology.

Local unions may be organized on different bases. Generally, blue-collar and white-collar employees tend to belong to separate organizations. In Britain, for instance, unions tend to organize employees with similar occupations, and the blue/white collar distinction is automatically preserved. In Scandinavia, in contrast, one of the local unions organizes all blue-collar employees and (usually) another all white-collar employees at one specific firm.

In each community, there exist coordinative bodies which comprise all local union organizations; on regional and national levels, each union tends to be associated with branch-organizations which are coordinated through a national parent organization.

Because their work situations usually are less satisfactory, we have reasons to expect that blue-collar employees are far more easy to organize into unions than are white-collar employees, and we can easily indicate different rates of union association. Although most unions have quite many tasks, we shall mainly focus upon their *wage-raising* actitivies. They are assumed to take a prime interest in raising the wages of their members such that past and expected price increases are compensated. As a

second basic task, they are assumed to advocate the exclusive employment of people who already are union members, and they may exert pressure upon their employers in order to achieve these goals.

On the side of their opponents, we can easily model branch organizations and national parent organizations which unite the branch organizations.

(Relevant literature: Flanders 1969; McCormick and Smith 1968.)

3.6. Social Classes

We shall conceive of social classes as extensive population layers which are composed of population categories which have similar positions in the economic structure and thus to a great extent have similar interests. Since 'similarity' is a transitive relation, there will most often not be 'natural' class boundaries. They must be drawn by convention instead.

Let us recall the structuring of the population into categories as discussed in section 3.4. The field of occupation and autonomy at work were considered as two crucial variables which tend to account for quite many differences of the everyday behavior and experience of man. Using these criteria, we can distinguish four major groupings which rather closely correspond to the common-sense conceptions of 'farmers', 'workers', 'middle-classes', and 'upper class'.

Farmers comprise the *medium* and *low* autonomy categories of the agricultural subsector. Thus, both the upper layer of high autonomy and those at the very bottom are excluded. These people are independent small-holders, peasants and free-holders who, by virtue of their specific relationship to Nature tend to have their own interests, and they tend to be opposed to workers (who often claim reduced food prices), to upper classes (who tend to take the profits of financing their activities and the distribution of their products), and also to the urban middle classes (who often tend to lack understanding of rural interests). They have incomes in parity with industrial workers and lower white-collar employees, and although they formally

can have much capital, their land, buildings and machines are rarely easy to convert into cash, and therefore their wealth is by no means in parity with their formal ownership.

Workers comprise the very *lowest* autonomy group of the *agricultural* subsector, that is: farmhands, maids and crofters; they further comprise all other *low* autonomy groups of the *primary* and *secondary* sector, and of *transport*, *trade*, and 'pure' *service*. In other words, these are the groups which deal with the production, processing and distribution of material utilities, and they are *directly* involved in the production process. We include here also the rural 'Lumpenproletariat' who can survive on its annual yields but nothing more.

These people are economically in a subordinated position; and their situations are all quite similar irrespective of their occupational types. They have incomes of a size that allows them to maintain themselves and live quite well, but they have few opportunities to accumulate larger amounts of capital; they rarely have any considerable wealth. (One might almost automatically expect that they spontaneously would organize themselves into political units; this assumption, however, can be quite misleading, as the American example of an only very loosely politically organized working-class indicates.)

The middle classes represents a rather heterogeneous collection of *self-employed entrepreneurs* in all sectors except agriculture, of *white-collar employees* in industry, and of *low-level and medium groups of employees* in the tertiary sector. It is typical for all these groups that they tend to have

a position between the powerful upper class and the often militant and threatening working class. This cross pressure has the effect that the middle classes rarely can become organized in one unified party.

They have intermediary levels of income and wealth and thus tend to support demands from those below on certain economic redistributions, but they tend to counteract demands of pure equality.

The upper class has a far clearer position: it represents the *top autonomy* groups of all sectors in the economy, and as such, it is an *elite layer* which comprises people who by virtue of their skills, their influence and their property have obtained and retained socioeconomically beneficial positions in society. Irrespectively of the subfields they occupy, they tend to have vested interests in the continuance of ongoing socioeconomical processes. (As yet, no system has emerged which has a complete lack of internal stratification with non-equal distributions of benefits and privileges.)

Also categories not included in the labor force belong to the class structure. Unemployed people, for instance, generally belong to the class they formerly belonged to (continued unemployment can cause downward mobility in this respect); housewives and children belong to the same class as the breadwinners of their households.

This overview of social classes excludes by no means the possibility that there may exist considerable internal differences within the classes, and internal competition and rivalry among class members on internal dominance. On the contrary, this is quite in accordance with our general assumptions concern-

ing social phenomena. Second, the partitioning of the population into social classes does obviously not exhaust the range of societal conflicts of interests, but only few other conflict types (wars, for instance) have wider implications.

(Relevant literature: Dahrendorf 1961a; Therborn 1971 represents a shrewd neo-Marxist critical overview of this field.)

3.6.1. Class Consciousness

The location of people in the class structure according to the criteria of economic positions need not overlap with expected class identifications. The income distribution correlates quite closely with the position in the autonomy scale, and we must therefore search for some other discriminatory criterion which might account for varying commitments. *Wealth* seems to be such a determinant.

According to our general assumptions of self-interestedness, we expect that a wealthy person will tend to favor policies that maintain good yields from savings and capital investments; inflation must be moderate, etc. On the other hand, those who lack own means should rather be expected to claim that no benefits at all should be obtained from other criteria than pure work.

If we focus at the single individual, we expect that he will give equal weights to considerations both of the criteria above and his wealth, and resulting from this we obtain images of class member-

ship, mainly based upon the extent to which he is expected to *support* the maintenance of, and reinforcement of contemporary structures, or whether he is expected to *counteract* them.

It has been said before by critics of Marxism, but we wish to mention once more that the image of the workers as an army of impoverished people ready to revolt against society perhaps was adequate a hundred years ago in the slums of London or Stockholm, but it is definitely not true nowadays anywhere in Europe. Absolute wealth gaps between the classes may still be very wide, perhaps even wider than a hundred years ago, but the *average standard of living* has undoubtedly been raised also for the proletariat. And this, according to our general assumptions, necessarily will moderate their propensity to revolt against the ruling order and support revolutionary movements. Should we be wrong in our view of c certain prosperity also among the workers, there must exist very powerful latent streams of working class radicalism. The failure of the new Left, however, to become a powerful political organization, gives at least *partly* evidence in favor of our interpretation.

Still, however, there are people who for certain reasons have subjective class identifications opposite to our expectations. There exist very rich communists, for instance, and very poor people may support existing structures. In order to account for such paradoxes, we should use fuzzy indicators of class membership. Obviously, in more detailed models where we can consider personal experiences, such paradoxes will generally disappear.

3.6.2. Ideological Penetration and Class Mobilization

The weights associated with the two factors (wealth and 'objective' class membership), in the determination of class consciousness can be influenced, and whenever political organizations take part in such efforts, we call the process *ideological penetration* of population categories.

To the extent that there exist class-based organizations which attempt to implement class interests on a nation-wide level, and to the extent that these can organize 'their' classes, we speak of *class mobilization*. Observe that class mobilization and ideological penetration overlap only partially. There may very well, for instance, exist mobilization of the middle classes and middle-class penetration of both working classes and the upper class; this seems to be the case in the United States. On the other hand, the middle classes may also be quite unorganized and affiliated with working-class organizations; this represents the Marxist image of class polarization in a revolutionary situation.

We may even hypothetically imagine a strong mobilization of all classes. This would represent a high level of *general political mobilization*, but it seems rather unlikely that all population categories are equally easily mobilized.

Marxists tend to make a crucial distinction between classes seen as categories in the economic realm ('Klasse an sich'), and classes organized through political action ('Klasse in sich'). Only in the latter case can we expect that classes will exert

uniform influence upon the political processes (Cf. Poulanzas 1970, ch. 2). Although our class conception seems to differ somewhat from theirs, we fully agree with this distinction. Actually, we may consider it as a special case of our general conceptions of societal conflict-generation, as outlined in section 1.2.

We must emphasize here that also other criteria than class membership often are used in the strife for ideological penetration and mobilization of large population categories.

3.7. Political Parties

Political processes concern the regulation of society in its total complexity. Only through political power can societal agents expect to obtain and maintain control over a whole nation. This tendency seems to become increasingly pronounced as societies undergo technological and economical development. Mainly because development implies increasing specialization of societal subsystems, the *total-system* functioning becomes increasingly vulnerable and dependent upon a proper, frictionless functioning of subsystems - the needs for total regulation of society tends to increase. However, societal development also implies that the benefits of the total functioning of society more easily than before can be allocated in accordance with specific interests, and this makes the State come into a crucial position as an instrument of this allocation.

Universally, the State is the only structural unit which has the necessary means at its disposal for the implementation of such regulations. Characteristically, it has a crucial role in *all* contemporary societies, industrialized as well as underdeveloped, and its role seems to have increased in importance during recent decades.

Political parties have in most contemporary societies acquired the role of legitimate competitors for political power. In liberal democracies, this is perhaps their major function; in several one-party systems they also have a vital role in the policy implementation process, but this aspect shall not be discussed here. We shall here focus our discussions upon problems of political interests and

ideologies; more dynamic aspects of party behavior shall be considered in section 4.5.

3.7.1. Parties: A Working Conception

We conceive of *political parties* mainly as agents competing for political power (Cf. Duverger 1964; Rasmussen 1972, vol I, p 165f). They tend to be more or less closely associated with interest organizations which represent specific population categories, and they tend to advocate the interests of these associated organizations in the political realm.

According to the liberal doctrine, parties obtain their mandates to represent the people through support in secret political elections. Their man dates are restricted in time, and elections must recur within specific time intervals. However, the doctrine by no means excludes the possibility that parties quite autonomously formulate political goals and means to achieve them; representation is never assumed to be absolute and exact.

Although certain parties base their support upon non-economic criteria of social stratification, such as religious affiliation and membership in linguistic or ethnical communities, most parties in multi-party systems tend to be class-based. The non-economic criteria are furthermore rather closely correlated with underlying economic differentiations. Most religious parties, for instance, tend furthermore to be rather conservative, not only in moral issues, and where these parties are powerful, ordinary conservatism tends to be weak.

3.7.2. Ideologies

In their competition for political power, parties typically commit themselves to certain rather well-defined programmatic statements which have a characteristic stability over time. This is not only due to similarities in demands raised by underlying supporting population categories, or to tactical considerations; *ideologies* have a vital role in this connection.

We may roughly distinguish three main functions of ideologies:
i. First, they seem to have a crucial *utopian* function; they outline the image of the good future society aspired by the party.
ii. Second, they have an important *programmatic* function; they indicate classes of means which should be used in order to obtain these future goals.
iii. Third, to the extent that they are socially shared, they seem to be important means for *social control*.

As an example, consider the most well-developed of ideological systems, namely Marxism. A specified account of the future good society is there coupled with a well-developed strategy for its achievement, and once people have become convinced about its truth, it can work as a justification even for very severe social control.

In summary: we regard ideologies as *general strategies for societal policy-making*, which thus comprise both the future goal and the alleged necessary means to achieve it. Depending upon the actual political situation, they may be system-maintaining or system-transforming, revolutionary or reactionary.

(3.7.2a) We shall summarize the *contents* of party ideologies in terms of five core dimensions which represent both the utopian goals and the necessary means. Using these, we obtain at least a rough classification of ideologies concerning their positions in the economical, political, and cultural realms. (For somewhat different views, see Helenius 1969, Björklund 1967, Downs 1957.)

i. In the *economic realm*, ideologies may adhere to principles of equality or they may support inequal distributions of incomes and wealth. There is a general left-right distinction on these matters. This dimension comprises both incomes and wealth; equality with respect to one dimension does namely not automatically imply equality on the other.

ii. Ideologies differ also regarding the extent to which they advocate *public versus private initiatives* concerning the management of societally relevant tasks. There is again a distinction between left and right in the traditional sense. Eventually, we might also make a distinction between recommendations of *centralized versus decentralized policies*. Through the combined use of these two dimensions we may distinguish classical liberalism, which advocates private decentralization, from socialism which advocates collective centralization. Conservatism tends to accept private centralization, and the Yugoslavian economic experiments seem to represent a form of collective decentralization.

iii. In the *cultural realm*, we may distinguish between principles of cultural homogeneity and uniformism at one extreme, and cultural pluralism at the other. Typically, liberal ideologies tend to advocate the pluralistic alternative, while both

conservatism and socialism are either less committed to this issue or advocate less pluralistic policies.

iv. In the *political realm*, there is a parallel distinction between those who advocate *political pluralism* and those who advocate *non-pluralistic policies*. Also here is liberalism the most consistent advocate of pluralism, while totalitarian ideologies of different forms typically accept only one alternative. Also classical conservatism tends to be rather non-pluralistic.

v. Still in this realm: parties differ from each other concerning their advocation of the *use of physical force* as a means to implement and maintain their purposes. This differentiates revolutionary and militant parties from reformistic ones.

Compared to the other four dimensions, however, this dimension has a somewhat special character. Obviously, very few parties openly advocate violence as a goal in itself, and even fewer parties forbid the use of violence as an ultimate means. The position on this dimension must therefore rather be considered to be the result of a decision-making process based upon an analysis of the current sociopolitical situation. In situations where a party is politically suppressed, it will tend to recognize violence as a legitimate means for goal implementation. Generally, the more significantly the party's goals on the other four dimensions differ from the current socioeconomic situation, and the more rigid and intensive the political repression against it, the more desperate will its members be, and the more likely will the party adhere to violence as a legitimate means. On the other hand, in situations where the political climate is less

repressive, *all* parties will be less willing to risk the use of violent militance, and this seems to be valid also for those for which Utopia is very far away.

(This dimension, however, is far more complex. Once a party in power finds out that certain opponents are prone to use violence, they will at least increase their control over them through closer observation. This, in turn, obviously will make those in power more suspicious, and the vicious circle is closed.)

(3.7.2b.) Using these dimensions for classifications of party ideologies, we can obtain rather comprehensive descriptions of their abstract, basic positions. However, in concrete instances we must also consider party positions on *issues of acute interest*, generated through the course of political processes. For such issues, there are typically no logically necessary couplings to the general ideological principles; instead, tactical considerations have usually a more important role for the choice of position. It is impossible to indicate *a priori* the content of such issues, but they are to evolve as conflicts or as problems in the course of the simulation of the macrosocietal model.

(3.7.2c.) We shall use the five ideological dimensions and the short-term issues as descriptor dimensions of the *current sociopolitical situation*. As to the fifth of the ideological dimensions, we shall indicate the *actual use* of repressive policies, implemented by the government in power, and directed against opposing forces in society.

(3.7.2d.) The empirical valuation of these dimensions is of course quite difficult, and we envisage separate subprojects which can focus their attention directly upon these problems. However, problems in these realms are especially difficult because parties have a tendency not to be too articulated in their programmatic statements; they are often vague on purpose. Therefore, we shall use a few fuzzy positions on each variable which indicate the general tendencies of party ideologies rather than exact positions. (There are perhaps quite often no exact positions in reality either.)

(3.7.2e.) Priorities can be obtained through a comparison of actual states of affairs with the utopian goals. Thus, the greater the difference on some dimension, the greater will the priorities be for changes of structures in these respects.

Also here exist certain complications. If a party P perceives that some of its opponents attempt to change certain structural arrangements, the preservation of which P considers beneficial or important, it tends to emphasize the maintenance of these as an essential purpose.

3.7.3. Political Interests and Interest Formations

As we have indicated in our general conception (chapter 1), we assume that societal agents have basic interests in the maintenance and improvement of their own socioeconomical strengths. How are these interests related to political ideologies? This is a core problem for all conceptions of the emergence of political ideas, and although we have

no *a priori* solutions, we believe that certain indications may have reasonable foundations.

We assume that social agents base their judgments of societal structural arrangements upon the criterion whether these are beneficial to them. They tend to base their suggestions for structural changes upon their own past experiences with such procedures. Let us, for example, indicate some main tendencies concerning the interests of social classes:

i. As far as *workers* are concerned, they tend to support economic equality. This tends namely to favor their own relative power; redistributions will mainly serve their interests because these necessarily will be at the expense of those better off. Concerning their own experience, they have gained their political influence and economic power through collective efforts; individually, each worker is rather weak, but when workers organize they can become powerful by their sheer numbers. Their propensity to support collective economic initiatives stems from their view that these can be a means to control their opponents, and it is a function of their own past success in collective efforts.

Tolerance for cultural minorities is a prerequisite for obtaining mass support for one's goals and the politically organized working class generally tends to support cultural pluralism, often in opposition against 'established' patterns. Workers also tend to support universal suffrage, since their class has been in majority in many nations; this is also compatible with the general democratic characteristics of early unionism. All we can say

regarding the fifth dimension is that the actual policies chosen in different nations is a function of the specific political and historical development and situation in each case.

ii. The *middle classes*, in contrast, tend to adhere to less egalitarian policies. They comprise people who most often obtained their positions through extra efforts and individual initiatives, and they typically tend to have a belief in 'the man in the street' who must combat both public collectivism and big private monopolies. They tend to support a moderate egalitarianism which provides sufficient inducements for those who contemplate making individual efforts, but which simultanesously restricts the privileges of those best off because these often have gained their fortunes through inheritance. But they tend naturally to oppose consistent egalitarianism, because this would undermine their ambitions and endanger their own slightly favored positions.

These classes comprise very heterogeneous categories, and their only chance to obtain influence is through cultural pluralism. They have also been the classical adherents of political pluralism, although they originally had fears of too far-reaching democracy, because they expected that this would immediately bring the masses to power and prevent the most able people from coming to the top. (Cf. the writings of classical liberal philosophers. Wolin 1960, ch. 9, presents a critical account.) Conflict is a natural characteristics of their environment. Historically, they have tended to be leading forces of revolutions against *anciens régimes*, wherever they have existed; but they were also the main supporters of both Italian fascism and German Nazism.

iii. *Farmers* are politically quite isolated. Beyond their own welfare, they have mainly been supporters of policies favoring rural areas at the expense of urban ones, and they have tended to support culturally conservative policies. What regards politics, many studies have shown that they have taken part in both extremely radical movements and in support of very conservative policies. Situational circumstances seem to have been determinants of their different choices.

iv. The *upper class*, finally, tends to have opposed egalitarian attempts regarding economic distributions. However, its members have often succeeded to gain advantages also in situations where considerable redistributions have been undertaken, mainly as a result of the general inequality-generating (and regenerating) processes indicated in section 1.2. Insofar as they succeeded to stabilize their own positions in new situations, in turn, they tended to oppose changes anew. The preservation of status quo with regard to economic distributions is naturally crucial for them. (However, in situations where their positions have been (said to be) seriously threatened, they have tended to give active support to reactionary forces, as the recent Chilean example unfortunately illustrates.)

Concerning private versus collective initiatives, this class seems to be somewhat split, as it comprises the top layers of trade, industry, and public agencies. There will be a tendency to accept public initiatives in certain fields provided there will instead be liberties of action in others.

When the 'establishement' is closely related to certain social contexts, like churches and linguist-

ic and ethnic communities, it tends to oppose pluralistic policies. But if it is in itself heterogeneous, it will support cultural pluralism.

The same can be said about political pluralism. Although the upper class has been opposed to universal suffrage, it seldom openly advocates restrictions in systems where it has been introduced. Concerning the fifth dimension, this class is perhaps the most 'flexible' one; as its prime political interest seems to be stability, it will support *any* parties which can promise to bring it about, provided that its members can continue to run their own business in peace. It is therefore always also very difficult to predict which candidates for power it will support and which types of policies it may accept - except, of course, socialist forces which it consistently tends to counteract.

v. These very general considerations are only meant to indicate some main directions of the interests we can expect to be openly advocated by organizations which mobilize specific social classes. Insofar as parties are associated with these organizations, the former will likewise express such interests in these matters which they assume to be popular in their specific electorates.

3.7.4. Party Structures and Election Systems

Once there was a so-called traditional-legal approach in political science which predominantly focused its studies upon enumerations of formal institutions, legal arrangements, and the like. More recent studies have been more 'functional' in the sense that they are paying greater attention to

political processes. Our modelling necessarily implies a fusion of these two views.

One set of speculative generalizations has concerned the relationships between election systems and party structures. Certain students have noted the empirical co-occurence of two big political blocks in systems with one-man majority constituencies, predominantly in the Anglo-Saxon world. Multiparty systems, in contrast, are far more common in systems with proportional elections, as are usual in continental Europe. These phenomena have been used for speculative generalizations on alleged causal effects of election systems on party structures. (Cf. Duverger 1964, who makes heroic efforts in these respects, p 216ff, pp 239-255.)

Other striking facts concern the long-term stability of party structures as such. Thus, despite considerable variations in preferences for each party, the same five parties have dominated the political scene in Sweden for more than forty years, and in Britain and the United States the party structure is even older. Where so-called 'dissatisfaction parties' originated, they tended to fade away rather soon again. Lipset, for instance, cites the French Poujadist movement as such a case (Lipset 1966, ch 5), and in West Germany, the pseudo-nazist NPD which had its most powerful period in the late sixties now seems to have lost almost all of its former influence.

However strange such phenomena may be, we cannot simply ignore them, Only through simulation modelling, however, can we expect to regenerate them through alternative explanatory submechanisms. We wish to use a modelling flexible enough to permit

the presence of alternative party structures and election systems, and we might thus also be able to identify the true relationships between these two phenomena.

3.7.5. Internal Party Organization

Analogously to the flexibility in party structures and election systems, we also wish to permit varying types of internal party organization. according to membership criteria, types of basic units, etc. (Cf. section 4.5.5b.)

3.8. The Formal Political Structure

If we attempt to generate total societies, we necessarily must include also the formal political centra on different levels. We shall thus generate the Head of the State, a parliament, and a government with its bureaucracy, or their equivalents on at least two levels, the local community and the national level; where regional units have autonomy, corresponding entities should be generated also for these.

We wish to be flexible in our modelling of these units. The Head of the State may thus be an elected or a self-appointed president or he may be a monarch with a life-long inherited formal claim to his position. He may be a powerful head of the government, or a powerless figure-head. Similarly can the parliament be a passive compliant unit which simply endorses governmental proposals after they have been accepted by some key figures, or it can be actively engaged in the policy-making process. And the government may have very far-reaching powers or simply be a passive policy-implementing unit.

Historically, different trends tend to persist over time in different nations, and these tend to become codified in constitutional prescriptions. Within these frames, however, there may be considerable variations due to the internal dynamics of the political process and the interaction among the participating partners there. Therefore, we can never consider the constitutional arrangements sufficient for an adequate knowledge of the actual political constellations; the morphology generation must identify the concrete power-holders.

(Similar considerations are of course valid for all levels of aggregation, and also for the relative powers on different hierarchical levels.)

Thus, when we generate the formal political bodies, we first list them and indicate their formal spheres of influence, and then we indicate their true ranges of influence, as generated through the current political constellations.

(Relevant literature: Rasmussen 1972, Vols I & II.)

4. Societal Processes

Once the morphology has become initialized and we wish to trace the changes of the system through time, we apply behavior rules to its elements on different levels.

Different types of approaches can be used for modelling system behavior. We can either indicate changes without specifying the underlying generating mechanisms, we shall call this approach *extensional*; *or* we can indicate systemic changes through a modelling of the generating processes; we shall call that approach *intensional*. Whenever we wish to model a dynamic phenomenon, we tend to start with quite rough indications of extensional tendencies and invariances. Successively, as we obtain more information, we may specify the underlying mechanisms.

In this section we shall mainly indicate extensional rules for societal processes, such as *rates* of marriage and fertility instead of detailed models of the underlying processes through which people happen to meet each other and decide that they want to have children. However, since our model is modular, we can easily replace extensional rules with intensional ones as soon as we consider it appropriate.

The replacement of extensional rules by intensional models implies an *increased adequacy* of our modelling. It is well known that macro-level relationships between a set of variables can have a multitude of underlying causes, and relationships observed on macro-levels do not prove the existence of direct 'causal' connections but may be more intricately

determined patterns of occurences of events. When we obtain information concerning its underlying mechanisms, our knowledge about a process is therefore substantially increased.

These considerations should be kept in mind as we discuss the modelling of societal processes below.

4.1. Economic Processes

We have no intentions to discuss abstract macro-economic theory, although we envisage the goal of ultimately meeting with macro-economic theory. We wish rather to approach economic processes from quite another angle, namely by considering which repercussions the everyday behavior of man has upon the economy in a region, provided that the morphological specifications have been made.

a. Man attempts to survive, and to do it comfortably. This simple assumption represents our point of departure for the simulation of economic processes. Let us therefore, quite arbitrarily, start with his needs for food, clothes and other nondurable consumption products.

In order to obtain *food*, most people must buy it in shops, or eat it in restaurants, which have made their purchases at shops or wholesale firms. Shops, in turn, obtain their goods from wholesale traders, who make their purchases from food producers, be they individual farmers, food industry, or import warehouses, and industries ultimately obtain their raw material from rural areas or through import.

The transportation of food from the raw material producers to the consumers implies a need for transportation by lorries, railway, ships, airplanes, and, to a smaller extent, by domestic animals. All links in this chain require furthermore that people are engaged in these types of work.

Similarly for *clothes*; most people buy them ready-made in shops; they have been 'manufactured' out of cloth bought from cloth mills, which use materi-

als woven or spinned in textile mills. Raw materials come from Nature as wool, cotton, linen and silk, or from petrochemical industry in the form of artificial materials.

For other nondurable consumption goods, we may specify similar chains of requirements, and a certain number of people must be engaged with the satisfaction of each demand.

Most people must *work* in order to obtain the necessary means for their own regular subsistence. The mere fact that people must be transported from where they live to where they work generates considerable everyday needs of collective means of communications. Similarly, a traffic system is needed which can stand the great peaks of traffic concentrations in the morning, and afternoon rush hours.

Leisure activities typically involve the consumption of goods not necessarily needed by people, and engagement in cultural and political activities which can have long-term effects on their preferences, but which usually have no immediate effects. Economically, however, such phenomena are important. Much of our consumption of non-basic goods is namely generated by them, and also the cultural climate of a nation has certain economic implications.

Through changes in family patterns, consumption habits tend to change considerably. Each family formation typically generates new demands for an own apartment, furniture, household equipment, and electronical products. Successively, as people have children, they tend to need more dwelling space, often a new car, a perambulator, et cetera. When their economic positions become stabilized, they

usually try to purchase a house of their own, for the sake of space, autonomy, and perhaps also prestige.

Since most populations tend to increase, we must expect that such demands can seldom be met only with the existing stocks of buildings. New residential areas and service centra need be built, and as older areas become worn down, they will be modernized and/or rebuilt, and these efforts have great importance for the total economy.

Now and then people become ill, or hurt in accidents, and they need medical care. Hospitals require nowadays considerable capital investments. The more technically advanced the application of medical care, the more specialization, the more people become thus engaged in this branch, and the more expensive instruments are needed. Perhaps this also implies a centralizing tendency; certain hospitals grow larger while other ones are closed down.

All types of studies which focus upon differences in consumption habits (for example, leisure activities, communication and transports, etc.) seem to be relevant here as they provide data for the generation of these types of processes.

b. On the *industrial* side, people are employed in the production of goods and services demanded through the everyday needs of man. Industrial enterprise is a very costly affair, and demands for high efficiency generate continual reinvestments in machines and buildings which require great capital loans. These are provided by banks and other financial institutes, in return for a certain interest compensation. It is quite trivial to note that

business firms neccessarily must manage to cover the costs generated through their everyday maintenance, plus the capital interest costs, depreciations of machines and equipment and stocks of unsold products and raw materials, and also a certain buffer needed to cover potential losses due to breakdowns of customers, sales losses, et cetera.

Although we make no *a priori* assumption of profit maximization principles, it is quite necessary that business firms are run on a basis which implies that these basic costs are covered in the long run. Obviously, a firm can stand losses for one or a few years, simply because they can afford to build up reserves for such purposes during profitable years, but in the long run they cannot persist below this minimum level of profitability.

The everyday industrial needs for raw material, semifinished products and equipment generates demands for such products from other firms, and once a firm makes investments in complicated machinery and production processes, series of orders may be generated which affect a whole branch.

c. Not only the everyday consumption of man has a crucial influence upon the economy; public commitments tend similarly to have great stimulating effects. Thus, whenever extensive infrastructural plans are implemented, many people are put into work both directly through the concrete tasks undertaken, and indirectly, through the orders and investments generated as a result of these decisions.

Studies which focus upon so-called spin-off effects are highly relevant for this subfield.

Not all public commitments result in such concrete material manifestations, however; many tend to result only in expansions of the administrative superstructures.

d. As a programmatic goal for this field of modelling, we envisage the development of a complex, detailed model which can give the macro-economical analytical constructs reasonable foundations on lower levels, and which will be able to *generate* economic cyclical changes of prime importance for contemporary society.

4.2. Demographic Processes

a. We shall achieve demographic changes through mortality, household-making and -dissolution, and fertility through the use of standard rates used by demographers. Migration phenomena, however, shall be accounted for by underlying processes which generate them.

b. Changes through *mortality* shall be achieved through the use of age- and sex-specific mortality rates. It is perhaps not difficult to specify the details of mortality determinants, but we must ultimately use **rates.**

c. *Household-making* shall equally be modelled through general rates, as used by demographers. The underlying mechanisms are relatively easy to model, and we expect therefore that these rates quite soon can be replaced with marriage subroutines. Using household-making functions, we must not deal exclusively with formal marriage, which seems to cover only part of the phenomena, although empirical data are more difficult to obtain on non-married couples.

(Generally, *formal* differences in marital status have no importance on the micro-level. On a macro-level, however, they may be quite important. Many taxation rules, for instance, differ between married and non-married couples. Furthermore, most public statistics are based upon formal criteria.)

d. *Fertility* shall also be modelled through the use of age-specific rates at an initial stage. On this level, exact modelling seems again quite difficult. We must accept a considerable range of random fluct-

uation, because still quite many pregnancies are unplanned. Our modelling should anyway consider differences due to social status, education levels, economic positions, earlier pregnancies, age, etc.

e. *Migration* shall be directly modelled through consideration of education, occupational choices, household-building, unemployment, and changes of work. Beyond these phenomena, few factors seem to have any considerable influence upon physical migration.

(Relevant literature: Orcutt et. al. 1961.)

4.3. Social Mobility

In this submodel we focus our attention upon educational processes and phenomena of occupational choice, both after the termination of primary schooling and during later stages in the life-cycle.

4.3.1. Educational Choices

We make a rough discrimination of levels of schooling according to the duration of education beyond primary schooling; the following classes are used:

Education level	Corresponding duration
a	Primary schooling only
b	1-6 months further
c	7-36 months further
d	37-96 months further
e	97-240 months further

These levels roughly correspond to the distinctions between primary, secondary, and tertiary schooling. Empirically, there is a strong bias in favor of the first subclasses, quite few people pass post-graduate university studies.

As a default rule, we assume that the level of autonomy at work which the father had is crucial in influencing which levels the children will aspire. Children are assumed to aspire at least as high levels of autonomy as their fathers have.

These assumptions can be summed up in two transition tables which indicate the probabilities that a

child whose father has a specific autonomy level will choose a specific educational level. We make a distinction between males and females, and we use the following values:

Males Father's Autonomy	Cond preferences for educational choice a	b	c	d	e
Indept	none	none	half-of	most	all
Semidept	none	few	many	most	all
Dependent	few	some	most	most	all

Females Father's Autonomy	Cond preferences for educational choice a	b	c	d	e
Indept	none	few	many	most	all
Semidept	few	some	most	most	all
Dependent	few	several	most	most	all

(The tables should be read as follows: Of *all* male children whose fathers have dependent jobs, *few* will stop directly after primary education; *of the remaining proportion, some* will terminate their education after 1-6 months, etc.)

For upper levels of education we assume that differences due to parental influence and sex tend to fade out, although certain differences will still exist which tend to favor males. For instance, a greater number of female than male children of 'dependent' fathers stop in b.

More detailed models in this field should of course reveal more of the underlying mechanisms which generate these phenomena.

4.3.2. Occupational Choices

When a specific educational phase has terminated, a certain proportion of students leave schooling and enter the labor market. We attempt to simulate this process through a three-stage sequence.

a. Generally, the education level will co-determine the chances for people to achieve autonomy in their jobs. Obviously, however, there are certain sex-bound differences, too, although they may tend to fade out for higher positions.

We use the following transition tables as summarizing default rules for the probabilities that people with specific levels of education will espect to attain a certain level of autonomy. (The tables should be read as follows: Of males with no further education than primary schooling, *none* will expect independent jobs; of the remaining proportion, *few* will expect semi-dependent jobs, and of the remaining proportion after this step, *the rest* (by necessity) will expect dependent jobs.) As for educational choices, we make a sex-differentiation:

Males	Autonomy level expected		
Educ. level	Indept	Semidept	Dependent
a	none	few	*
b	none	some	*
c	some	several	*
d	many	most	*
e	most	all	*

NB. As before, "*" indicates "*the rest*".

Females Educ. level	Autonomy level expected Indept	Semidept	Dependent
a	none	none	*
b	none	few	*
c	few	some	*
d	several	most	*
e	most	all	*

b. The aspiration for accupational fields will be generated according to the table below. Transition probabilities are indicated for major sectors, not for the respective fields. This is again a Markovian matrix, although also here fuzzy probabilities are used instead for exact numerical values.

Father's Econ. sector	Child generation econ. sector Primary	Secondary	Tertiary
Primary	half-of	several	*
Secondary	few	half-of	*
Tertiary	none	*	most

c. We have hitherto derived aspirations for choice rather than actual choices. Which actual choices will then be made? This is mainly a function of supply and demand on the labor market. The state of the economy at the specific time-points when students are leaving school obviously determines the *demand* for labor in different sectors, as well as requirements for people with specific educational levels. The potential *supply* of labor in each sector, on the other hand, is determined through the number of students leaving school plus the

number of unemployed people.

At every point in time there will be a certain proportion of people searching for appropriate jobs who *cannot find any*. For these, only second-best alternatives remain, or unemployment, unless they continue their schooling.

It is always possible for people with high education to take underqualified jobs. It is almost never possible, however, for people with low education to take jobs for which highly-educated people are required, unless they have long appropriate practice.

4.3.3. Market Adjustments

Given a specific state of supply and demand on the labor market, we may also wish to simulate adjustments of transition-matrix values to labor market situations.

It seems intuitively reasonable that people not only choose their educational levels out of blind idealism, but that at least *some* people orient themselves according to market requirements and expected chances to get a job in the future. Analogously, for certain firms we may assume that they try to adapt their requirements (probably to a smaller extent than individuals do) to the supplies of labor.

This process might be modelled through the use of a recursive function which updates the transition probabilities *upwards* in case there is a great net demand for specific levels of education and/or occupation, and *downwards* in case of big net supplies.

4.4. Labor Market Processes

We have already noted that firms employ people and use them in their production of goods and services and pay them wages in return for labor produced. Here we shall focus somewhat upon the problems of conflicts between employers and employees and their regulation through bargaining processes.

Historically, relationships on the labor market initially had a character of mutual contracts between the employer and each employee (cf.Flanders 1969, p12). People worked for some time and got payment according to varying criteria, almost universally decided by the employer. Gradually, however, through the emergence of unions, these processes have become more regulated through collective bargaining. We shall not attempt to simulate the generation of unions here, but only indicate certain crucial processes in that field.

(Relevant literature: Flanders 1969; McCormick and Smith 1968; Walton and Kersie 1965. All these are specifically concerned with labor market problems. Holm 1970 and Gurr 1970 are also relevant in this context, although they have a somewhat wider perspective, focusing on problems of conflict in general.)

4.4.1. Employee Propensity for Action

a. Each group of employees has a specific *propensity for action* which is related to their incomes (negatively), their education levels (positively), the extent of unemployment (negatively), and the number of past strikes (positively to the extent that they have been successful).

b. For each group, we may further estimate its *strength of action* through its size (positively) the level of unemployment (negatively), its autonomy (positively), the size of its strike funds (positively), and average member incomes (negatively).

c. Each group is further characterized by a *coalitioning propensity* which indicates the probability that coordinated efforts will take place within it with the purpose of achieving common purposes. This is a function of its propensity for action (positively) and its strength of action (positively).

This propensity is obviously not the same as actual coalitioning, only a probability thereof. Thus, there might exist firms where unions and bargaining cooperation are to be expected, but where they for certain reasons are absent. On the other hand, there may exist unions which persist only by virtue of an administrative bureaucracy which automatically maintains its further life, although no obvious external reasons for further continuance exist any longer.

4.4.2. Employer Tractability

Also an estimation of employer tractability should be made, corresponding to, and complementary to, the estimations made above. We consider it a function of the state of the market (positively), the solidity of the firm (negatively), the degree of unemployment (negatively), the number of past strikes (negatively), and earlier tractability (negatively if there have been many earlier strikes, otherwise positively).

These factors seem to summarize both the strength and the vulnerability of the firm which becomes confronted with a threatening strike situation.

4.4.3. Bargainings

a. We shall not simulate the bargaining process in its details, only indicate its results. Provided that no conflicting actions occur, the outcome of the bargaining process will be determined by the respective demands raised by the partners and their relative weights, estimated by the strength of each partner.

b. The *demands* raised by the employees can be estimated through a default rule: Generally employees attempt to obtain compensation for *past price increases* plus *expected price increases in the future* during the contract period. As a standard estimate, we assume that they demand *twice past price increases*. (With changed contract periods, this figure should be changed too, of course.)

We assume also that demands raised are adjusted in accordance with the labor market situation, namely according to an unemployment coefficient, C;

C:=(labor demands)/(labor supplies);

(where already employed people are excluded).

c. We assume for employers that they always will claim a status quo position at the outset, knowing that they generally must make certain concessions.

d. The bargaining output can then be estimated as a weighing of employee strengths with employer tractabilities. Outcomes should be regarded as fuzzy values, in order to account for local variations.

4.4.4. Conflicts

a. If one or both partners of the bargaining relationship are unwilling to compromise, conflict breaks out.

b. The actual result of the conflict may very well be different from that estimated in (4.4.3.) above. Especially if it has taken long time, partners may, for instance, appeal to other organizations for assistance through solidarity actions, etc., and in the long run will differential abilities of the partners to tolerate the damages caused them through the conflict determine the output.

4.4.5. Bargaining Satisfaction

After a bargaining session has been terminated, the propensity for further action among the employees seem to be influenced by their relative satisfaction with the bargaining output. As a default rule, it can be determined as a difference between wage increases obtained and demanded wage increases.

We may conceive of bargaining satisfaction as a basic conditioning factor, indicating underlying latent dissatisfactions with existing outputs. (The recently hardening labor market situations in partically entire Western Europe can perhaps be seen as being a function of rapid increases, followed by rising demands, and an inability of firms to meet these as efficiently as during the sixties, which generates more intense dissatisfactions with wage increases yielded than previously.)

4.4.6. Regional Coalitioning

If a given group has a strong propensity for conflict but cannot stand one, it may attempt to seek environmental support from more powerful agents in similar situations, which also are willing to go to conflict.

The newly formed coalition considers its opportunities anew. Both partners obviously obtain an impro proved absolute strength, and eventually also become relatively more powerful, especially if their opponents do not cooperate. To the extent to which they have taken part in previous common actions, their propensity for coalitioning will be proportional to their earlier benefits from coalitioning.

Through solidarity actions, the partners may support each other also when they are not willing to go to conflict, mainly through monetary support. The more frequently local unions cooperate regionally on an informal basis, and the greater their propensity for further cooperation, the greater is the probability that cooperation will be formalized. And once units of formal cooperation have originated, they tend to maintain themselves also beyond the initially proclaimed aspirations.

4.4.7. Regional and National Levels of Bargaining

Successively, such regional cooperation may generate also national units which successively take over responsibility for collective bargaining, especially when national parent organizations exist on both sides in a conflict. Such bargaining will mainly concern the criteria according to which

local bargainings shall develop, while local unions and employers make specifications needed for their firms.

4.4.8. Interest Organizations and Public Agencies

Interest organizations tend to have formal links to *political parties*, which, in turn, tend to represent sets of interest organizations with rather similar interests. There exists also often organizational representation in *public agencies* and advisory committees, through memberships in governing boards of bureaus, etc. Here, however, shall we only focus upon their relevance for the bargaining process.

In situations where direct conflicts threaten to develop, bargaining partners may appeal to public agencies in order to make them intervene through regulations. Especially the government has access to extraordinary means for such regulation, ranging from weak persuasive attempts to direct use of military force.

4.5. Political Parties

4.5.1. Party Origination

a. Sociologically. we may conceive of the origination of political parties in terms of complex collective adaptations to situations of societal conflicts of interests.

We expect that initiatives towards political action first tend to emerge from groups whose interests have been suppressed in the past course of socio-economical processes. They may have lost former privileges, or they mav be denied a legitimate right to participate properly in the societal policy-making process. Once they find that they have interests in common with others in similar situations, they may coalesce into common interest organizations.

On the other hand, when those who happen to benefit from the maintenance of existing structural arrangements find that others attempt to change them, they will consider such opposition *threatening*, and this might motivate them to countermobilize in order to resist the pressures coming from their opponents.

b. Historically, *changes in the societal class structure* by any means seem to be the most important processes that generate societal circumstances in which originations of new parties are most likely. The great transformations of the European societies from the 17th century onward brought about the emergence of a large middle class, which was the dominant force behind the revolutions in Britain and France. Later on, when the working class grew in size and in economic importance, socialist

parties originated all over Europe and successively obtained considerable influence. (Cf. Duverger 1964, introduction; Downs 1957, p 127ff.)

Parties can often be flexible enough to adjust to significantly changed societal circumstances, and the mobilization of new societal population categories can therefore be made within existing parties. In Sweden, for instance, existed a liberal worker association movement from the midst of the 19th century, which represented an attempt to mobilize the working class on a non-socialist 'enlightenment' basis. However, as the more militant socialist unionism and party movement grew up, the liberal movement could no longer maintain its influence.(Cf. Lewin et.al. 1972, p 152, p 166f.)

c. Public opinions tend to be rather fluctuating over time, they may blow up quite abruptly and very intensively and then fade out almost as rapidly again; only rarely do they persist for longer periods; and when this happens to be the case, it is usually only among some few zealots. Commitments made by political parties, in contrast, tend to be far more rigid. Except for purely opportunistic parties, most political agencies tend to base their policies upon more far-reaching purposes. (Cf. Wieslander 1964, p 24ff.)

In certain cases, however, public opinions last for long periods, and they may even attract increasing support. Despite this, parties may still fail to discover them (they may lack appropriate channels for information, for instance), or they simply ignore them. Provided that also other common characteristics unite the groups which support the actual issue, and if there is a general distrust of the

'Establishment' among them, the origination of new parties is rather likely in such situations.

Obviously, the originators of new parties may misjudge their chances, which a recent Swedish example amply illustrates. In 1962, there was a great campaign against what was described as anti-religious tendencies in the new school system. Through intensive propaganda and efficient organization, the initiators attempted to obtain more than 2 million signatures on an appeal for the maintenance of the so far favored position of protestant dogmas. This was interpreted as a powerful manifestation for a general distrust among people against the established political parties, and the origination of a new party, KDS (Christian Democratic Union), was proclaimed in 1964. That party, however, has never succeeded in obtaining more than marginal support from the electorate and has consistently failed to get any representatives into the parliament.

d. Compared to changes in social structure and lacking correspondence between public opinions and party policies, the mere increase of suffrage *per se* seems to have only marginal effects for the origination of new parties. Thus, when female suffrage was introduced in Britain (cf. Downs 1957, p 131), or in Sweden, no major changes in party preferences occurred. (For Swedish voting data cf. Lewin et. al. 1972, table at p 147, compare elections in 1920 and in 1921.)

4.5.2. A Formal Model of Coalitioning Effects

Slogans like 'unity gives strength', or 'the whole is something other than the mere sum of its parts',

have an intuitive, common-sense truth. Such ideas have been given a formal support by Shapley and Shubik (1954).

Let N agents ($J_1, J_2, \ldots J_N$), each with one vote, form a committee where simple majority is required for decisions. If a single measure shall be accepted, we must first persuade one of them, then the second, etc., until a majority exists. Obviously there are N! possible orderings of the N agents, and the last one we ask in each case is said to be in a *pivotal* position. Provided that we take one ordering at random, we may expect the *a priori* relative power of each agent as his probability to be in a pivotal position; thus, the sum total of relative power is one.

In the example above, each agent has a relative power of 1/N. Now, assume that two agents decide to support each other in all decisions; that is: they form a coalition. What can we say about their *a priori* relative power? Most simply, we can say that they constitute a new agents who has two votes; has the relative power of this agent simply doubled? No. Let us illustrate this with an example.

In an original situation, assume that there were N=4 members in the committee, and each of them had one vote and thus a relative power of 1/4. Through coalitioning, we obtain N'=3 members; call them A(2 votes), B(1 vote), and C(1 vote) respectively. The following permutations are possible, and for each one we have underscored the pivotal member:

A<u>B</u>C, A<u>C</u>B, B<u>A</u>C, BC<u>A</u>, C<u>A</u>B, CB<u>A</u>.

Thus, while A formerly had a relative power of 2*1/4= 1/2, it has now increased to 2/3; the others have suffered a loss of relative power from 1/4 to 1/6 each.

This simple example amply illustrates that the mere combination of two agents in formal structures has direct consequences for their influence. The relative power of the coalition is *not* merely a numerical summation of the powers of its members, it is greater. Now, the use of this example by no means implies that we expect to utilize this measure of power for practical purposes, it is too unrealistic for that. In most situations, for instance, we have far more *a priori* information about possible combinations of votes that is suggested by the assumption that all permutations are equally likely.

(Relevant literature: Bell/Edwards/Wagner 1969; a good collection of articles on these problems.)

4.5.3. Interest Aggregation

Most political parties are supported by more than one interest organization. They must therefore attempt to conciliate the interests of their supporter agencies. This represents what we call *interest aggregation*.

We focus here upon the organized cooption of supporting agencies; the actual content of party ideologies represents an aspect of interest articulation. However, also here the ideological dimension are relevant, namely in terms of the *internal consistency* of interests advocated by party supporters.

The mere enumeration of supporting agencies would be at best insufficient, and it can be highly misleading. It really makes a difference, namely, whether they have similar or conflicting interests. In the former case, they may quite easily coalesce rather spontaneously; in the latter case, however, they will rather tend to digress unless the party can somehow induce them to remain supporters.

The consistency dimension also indicates the probability of long-term stability of the party; the greater the consistency of interests, the greater likelihood for long-term stability, and the more easily will the party be able to mobilize its supporters.

(4.5.3a.) We may distinguish three consistency profiles:

i. Interests point into *similar* directions. Socialist parties, for instance, often have attempted to mobilize both industrial workers and feudal serfs; there is no contradiction in combatting both capitalistic industrialists and landlords. At the other extreme have conservative parties often mobilized both rural and urban upper layers.

ii. Interests are *complementary*. Liberal parties, for instance, often base their support upon both petty industrialists, middle-class teachers, and white-collar employees. The interests of these categories can hardly be said to be similar, but they are complementary in the sense that all can unite in their support of individualism and their belief in 'the man on the street'.

iii. Interests are directly *conflicting*. Also here, liberal parties provide interesting illustrations.

In Sweden, for instance, the liberal party has for a long time obtained support from both Free Church groups and groups with very radical and anti-clerical views on religious and moral issues. The Democratic Party in the United States is similarly well-known for having supporters with few other common interests than the winning of presidential elections.

(4.5.3b.)In summary: political parties basing their popular support upon two or more organizations encounter a *dilemma of interest aggregation*. Parties must have heavy organizational support; if they try to conciliate conflicting interests, however, they risk the loss of support from them all. Especially in multi-party systems, this support may even go to their opponents.

4.5.4. Interest Articulation

Parties do not only passively represent the interests of underlying agencies; they take also active part in their policy-formulation processes.

The more closely a party program corresponds to the interests of one specific supporting agency, the greater support will it obtain from that agency. Simultaneously, however, marginal supporters may withdraw their support.

This problem is crucial especially for parties which base their policies upon well-defined ideologies. Quite many groups may support them as far as only the abstract principles are concerned; but when they become specified may marginal groups withhold their support and digress. Often, they may

even create a competing party which, according to their own interpretations, makes more adequate analyses of contemporary societal situations. Such processes are quite frequent, especially in the extreme left.

However, also parties which by no means can be defined as extreme encounter the same problems. Many people can, for instance, support the socialist idea of increased equality, at least as long as their own positions become improved. Similarly, the middle-class demand for equity can be accepted by many although few support associated claims that taxation of trade and business should be reduced. And many conservatives undoubtedly would support an increased control of leftist groups, although fewer of them would accept a Chilean model.

This problem has also a second dimension. Parties must have electoral support in order to get seats in the parliament. They can therefore not look only at compatibilities with interests raised by supporting agencies, they must have a reasonable popular support, too. Thus, while Swedish liberals and socialists are republicans in principle, most election tacticians would consider it suicidal to advocate the abolition of monarchy in a political election; the support of the monarchy seems to be far too strong for that.

4.5.5. Political Participation and Recruitment

Although most people in Europe tend to sympathize with political parties and participate in political elections, only a minority of them take active part in campaigns, and still fewer are engaged in party

work and public functions.

4.5.5a. Levels of Political Participation

a. Duverger distinguishes three levels of political participation among the rank-and-file of the electorate, namely voting, party support and militance (1964, ch 2), and he envisages a hierarchic ordering of these levels.

i. *Electors* comprise Duverger's widest circle. Numerical values are quite easily obtainable for this category, and through long-term studies we may also obtain estimates of the stability of preferences among the voters (cf. Butler and Stokes 1971, for British politics), and voting studies typically also relate preferences to socioeconomic background data. (Cf. Valen and Katz 1967, ch 6, for a typical study in the tradition of political sociology.)

ii. *Supporters* comprises voters who openly manifest party preferences. Individually, a supporter tends to regard the party as a reference group for his political opinions, and tends to support the party through work during elections and/or with monetary contributions.

iii. *Militants* is the most narrow circle. They tend to be active in party work both during elections and intermediary periods; they are generally party members.

At least two categories can easily be added to this list:

iv. *Sympathisers* comprises those who tend to favor one party rather than another, but for some reasons

not vote for it.

v. *Leaders, bureaucrats and representatives* comprises an inner circle of people who are committed to the party through employment. (Cf. Rasmussen 1972, vol. I, p 181.)

vi. *Membership* represents a rather fuzzy category, due to variations in membership criteria, etc. However, individual members tend to have positions intermediary to supporters and militants; they are less active than militants, yet they tend to be more committed to the party than mere supporters.

b. We may conceive of these six participation categories both in terms of increasing *intensity* of participation, but also in terms of increasing *stability* of participation. Thus, intuitively, while mere voting represents only weak commitments, and can vary from time to time, party membership and militance represents far more intense and stable commitments.

4.5.5b. Party Recruitment

Different parties have different membership criteria, which are determined by the historical development of the party and its general, long-term purposes. Communist parties, for instance, have very strict criteria for membership based upon adherence to Marxist-Leninist principles and a readiness to accept strict rules of party discipline. Furthermore, as they consider the party the Vanguard Organization for the working masses and because they may be forced to go underground in case of political repression, they develop hierarchical systems

based upon small working-place party cells. Socialist parties, in contrast, employ a mass line; they have quite vague criteria for membership and they are organized on an area basis. They often employ the indirect-membership trick, and because they put an emphasis upon reformistic policies, they have extensive educational programs through which their members can be made fit to work in the party and in political bodies.

Liberal and conservative parties represent historically a third alternative. Although most of them nowadays tend to have a mass line of organization, like the socialist parties, they are mainly concerned with the gaining of power in formal bodies. They have very vague criteria of membership, only little party agitation, and they tend to have few activities during inter-election periods.

The American 'party machine' represents a variant of this structure with amorphous party units working on an *ad hoc*-basis; no formal membership criteria exist at all, and they work entirely as election committees. The fascist *militia* organization represents a further alternative, organized in military fashion in view of the goal of destroying the representative-democracy system.

4.6. Political Elections

Elections are typical for representative democracies. They exist also in other systems, but they have a less interesting function there. Officially, parties obtain their legitimation through support in elections, at least theoretically can voters also exert some marginal influence upon the political system. Only rarely, however, do elections concern choices of long-term goals or definite alternatives in controversial issues. Here we shall only indicate some general principles which are relevant as we attempt to model political elections.

a. Elections always occur in specific socioeconomic situations. Their general characteristics can be roughly summarized through the use of the five ideological dimensions in section 3.7.2, and their specific characteristics can be indicated through an enumeration of contemporary controversial issues. The government in power tends to be held responsible for the current societal situation, especially by marginal voters.

b. Elections concern choices between parties which can be described through the use of their abstract goals and how they are related to the current societal situation.

c. Electors tend to base their choice partly upon past votings, partly upon how well they believe that their interests can be served by the different parties, and partly on behalf of organizational and class memberships and their alleged interests.

d. When large population categories become spatially concentrated, informal interaction between them tends to achieve a homogenization of preferences. Such homogenization gives increased political strength, but does not warrant that the general preference is most adequate from an 'objective' point of view (in retrospect, for instance).

e. Stability of voting also tends to increase due to increases in party commitments. Although vaguely, voting expresses certain preferences, and the greater the intensity of participation, the greater will probably also the stability be.

Age represents also a stability-increasing factor, due to the general stabilization tendencies of one's life and social environment.

f. The *non-voting* alternative can be considered as the result of rational choice, or as the result of sheer desinterest.

g. Once first-hand preferences have been established, voters may weigh them with the probabilities with which parties will come into representation (such weights may be derived from opinion polls), and the weighed preferences represent the 'real' preferences.

h. According to the cross-pressure hypothesis, people tend to abstain from voting if their involvements split them. This can be modelled through a computation of the consistency of the results obtained according to the different criteria above. The greater the consistency, the greater the probability of voting. (Of course, different criteria can have different weights.)

i. For the derivation of party strength, we must obviously consider the election system, variations in suffrage, and other structural characteristics.

j. Once a new set of representatives have been elected, we generate a government through consideration of parties or coalitions with simple majorities or otherwise with as large minorities as possible. However, we must then consider self-imposed constraints by the parties (no conservatives and communists will normally cooperate in the same government, for instance); and we use therefore similarities of party programs as a basis for coalitioning.

4.7. Politics: Public Commitments

Scholars in the functionalistic tradition have attempted to specify the 'functions' of political systems. We shall now focus our attention upon the 'output' of politics, by considering which fields are generally covered by 'political' activities. David Easton, for instance, makes a fourfold division of output categories according to their modes and qualities; he distinguishes statements from concrete performances, and lets them have authoritative or associated qualities.

Easton speaks thus about *authoritative statements*, comprising the binding decisions, rules, laws, etc. made by the public agencies and which have a binding quality for the entire nation; *authoritative performances* represent the concrete implementations undertaken in these respects. *Associated statements* comprise interpretative and explanatory elaborations of binding decisions with the purposes of evoking loyal support, and *associated performances* are concrete benefits and favors given to specific groups (Easton 1965, pp 352-362). Easton says almost nothing, however, beyond these mere analytical discussions.

The second leading functionalist in political science, Gabriel Almond, is equally silent with regard to concretizations of the abstract categories. When he discusses output functions, namely, he simply utilizes the ideas of the classical doctrine of countervailing forces and gives them new labels; He talks thus about *rule-making*, *rule-applicating*, and *rule-adjudicating* functions, referring to the 'three powers' in classical political philosophy (Almond 1960).

Parsons and Smelser recognize similar functional interrelations between the four subsystems of their abstract social system, but they provide little help for a discussion of concrete structures (Parsons and Smelser 1956).

There is obviously great variation in the scope of public commitments. Any general list risks therefore to become meaningless or rather arbitrary. Yet, if we approach the problem from a morphogenic point of view, we might at least indicate certain crucial invariances.

4.7.1. A Non-Exhaustive List of Public Commitments

a. There is a general tendency that insofar as informal structures begin to become stabilized, they also tend to become formalized (cf. section 1.2.). In a whole society there is obviously a multitude of rules and norms which successively become generated through the stabilization and formalization of informal phenomena. (Evidently, we must conceive of these processes *dynamically*, such that certain very vague stabilization tendencies give rise to some mechanisms, which affect other mechanisms, which, in turn, can influence the initial state, etc.)

One of the earliest fields of public regulation concerns the right to give and take *citizenship*. Ownership rights, and the use of private property is another fundamental field for regulation.

Legislation is the instrument by which public agencies can formalize rules and norms of nation-wide relevance. Such formalized rules can concern any

fields of social activity, provided that they have some general relevance for the nation. Such rules must obviously be formulated quite flexibly, so that they are applicable in specific types of situations despite great differences in details. Through the *judicial system*, these principles are interpreted and applied to concrete instances of dispute and law-breaking, and through the *bureaucracy*, they become implemented in the relationship between official agencies and the people.

Legislation and administration means little, however, unless it can be *reinforced* through common public support and/or a certain use of *controlling police forces*. Police forces are used both in order to forestall potential opposition and/or criminal deviance, and for direct physical repression against opposition forces which are believed to threaten the ruling order.

Externally, certain nations are (and, above all, *believe* that they are) threatened by enemy forces. Almost all autonomous nations have therefore *military forces* as complements to their police forces. Their use is analogous to the use of police forces: they can be used for deterring and forestalling as well as for direct warfare. Furthermore, they can be used for mutual support among coalition partners against a common enemy; they are also often used for purposes of internal control. (As a matter of fact, they are a powerful factor in many contemporary nations. The impact of military intervention in politics has been studied by, among others, Finer 1969, and Luttwak 1969.)

As long as these problems above are solved in an integrated fashion, like in small autonomous comm-

unities, for instance, no structural differentiation needs to take place. However, increased division of labor processes seems especially likely where we are confronted with rather large populations in vast territorial areas; the ideals of referenda are impossible to implement there. And once division of labor vaguely originates also in these realms, administrative and protective agents must be supplied with material goods; and this raises the need for *taxation* in some form, through payment of goods (or people), labor services, or money.

In section 1.5. we assumed that taxation probably originated as a continuation of some *tributes* paid by repressed people living in areas won through warfare. It is possible that the general division of work might rise also among free men and thus also the need for taxation. However, we believe that it is hardly likely that such complex communities could grow up quite peacefully and spontaneously and by themselves, so to say, generate a taxation system. People must be *forced* to start to pay taxes; they will hardly do it voluntarily.

As long as collective activities are run on an *ad hoc*-basis, with collective problem-solvings occurring only as consequences of changed environmental circumstances, no planning or accounting seems to have been necessary or meaningful. However, when collective actions tend to increase in scope and become more regulated, conscious and planned allocations of means to specific targets becomes a crucial instrument for collective action. *Budgetation* and *planning* are thus important instruments for such regulations in modern societies.

Typically, public agencies also become engaged in *industry* and *trade*. Commitments may range from provisions of general security and freedom of trade to detail-controlled and planned engagement. With respect to economic politics, the regulation of *interest rates* seems to be a minimum level of commitment. Through this, a govenment can influence the climate of investments and the general costs of living. *Customs fees* and *purchase taxes* represent a second minimum level of concern which, by the way, has shown to be very profitable, both historically and nowadays. *External trade* is similarly often regulated through public agencies. But also *domestic trade* was regulated previously in history, through grants of merchant privileges, guild systems regulating handicraft, and town charters regulating locations of economic activity.

Public agencies engage also in certain forms of *construction*, notably of *defense* equipment, *city* planning and *communication* routes. These fields have historically had a crucial importance both for military activities and for trade.

b. Beyond these general fields, there are other ones, which, due to historical circumstances and ideological prejudices have happened to obtain not so clear-cut commitments. *Health* is a typical example. Although institutions for health are universally existing, they may be run by public agencies or privately, they may be free or you may have to pay the treatment. Similarly, social *welfare* institutions also exist almost universally, although quite different agencies may have assumed responsibility for them. *Education* also has the same character.

(Historically, the Roman Catholic Church has maintained considerable activity in all these fields; during the 'dark' periods of the middle ages, for instance, monasteries and churches had a primitive health service and also some welfare activity, especially in periods of famine and epidemics and/or in warfare periods, when they were places of refuge. Priests and monks were also often the only ones who had some elementary practice of reading and writing and they often served as teachers. It should be kept in mind, however, that the same Church also was responsible for much of the troubles which it tried to save people from; local bishops were equally militant as common manorlords, and through the tithes the peasantry was heavily exploited.)

Also in purely *cultural* realms, commitments vary considerable. In Eastern Europe, for instance, one gives high priority to sports, music and theater, while there are other emphases in Western societies. Often, for instance, there are formal coalitions between the State and specific religious organizations; Japan, Iran and Ethiopia are perhaps extreme cases, but they illustrate that such bonds can persist despite considerable differences in industrial development.

4.7.2. Ideologies and Commitments

Part of the differences in scope and content of public commitments results obviously from ideological differences.

Reconsider the discussion of filtering processes in section 2.3, where we indicated probable differenc-

es between conservative and communist policies. Ideologies, political programs, election promises, policies, and statements on current issues; all these factors constrain the range of free choice of the party in power.

Furthermore, despite the fact that there rarely is a one-one correspondence between ideological positions and concrete decisions, parties tend to constrain themselves not to cooperate with their ideological opponents; not even where this logically seen very well could be done. Tactical considerations seem to play a crucial part in this respect.

4.7.3. Policy-Making as a Multi-Stage Concretization Process.

Although no strict correspondence exists between ideologies, policies and concrete decisions, certain correlations still exist.

We may account for the policy-making process as a multi-stage specification and concretization of abstract ideological principles. In each specification step, there is a confrontation between the general constraints and relevant aspects of reality, and resulting from this, less abstract principles are derived. These are then used for more specific formulations until the levels of concrete reality are achieved. (Cf. Wieslander 1964, p 24ff.)

Typically, ideologies and party programs are far more stable than the content of everyday decisions. In the long run, however, also the most abstract programs tend to be modified, such that established parties change their abstract goals in response to

their confrontation with a changing political reality, for instance because new ideologies have originated. (As an interesting example, we may consider the current development in Norway. The anti-EEC movement united very heterogeneous population categories in a common mistrust of both rigid communism, monopolistic capitalism, and bureaucratic tendencies; in short: with clear *populistic* tendencies. We would not be surprised if the formulation of a new radical alternative in Norwegian politics would result from this movement.)

During periods of *crisis*, we can expect that decision-making becomes less ideologically biased, and more pragmatic in orientation. (The British liberal government during the first World War, for instance, introduced systematic economic planning and control, and in the Soviet Union during the Second World War, the rigid Stalinist planning was considerably softened. In both cases, production efficiency increased considerably.)

4.8. Public Bureaucracy

The study of bureaucratic phenomena is a recurrent theme in contemporary social science and the literature dealing with these problems is very voluminous. We have no intention to discuss these matters here, however, because even a superficial review would require extensive space. Moreover, problems in this field seem so interesting and intricate that we think they deserve more thorough discussion in a separate monograph.

Among contemporary scholars, Michel Crozier (1964) seems to be the one whose conception comes closest to our own. He makes an attempt to synthesize the individual-focusing views of March/Simon (1958) with the structural-oriented approach found in Blau/Scott (1963), and his use of this synthesized conception for the analysis of empirical cases is remarkable. Long-term case-studies of public administration and local communities based upon that approach would be very stimulating. Further innovations in this field do not (at least not for our parts) seem likely until we can make detailed simulations of bureaucratic processes.

(Relevant literature: March/Simon (1958), Blau/Scott (1963), and Crozier (1964) are obvious studies in this context. March (1965), Mayntz(1968), and Merton (1965) are somewhat heterogeneous, but they contain several significant papers.)

4.9. Conformity and Deviance

Sociologists tend to approach problems of social control from a vague 'social' point of view. As we consider the problems, however, they are to a crucial extent *political*.

Insofar as a given societal system is formally organized, it also has a set of codified norms and rules which indicate criteria for adequate behavior in important aspects of societal life. They originate, like all other societal phenomena, in the course of social processes, and those agents who have control over the State, have also the ultimate control over the content of laws. This implies necessarily that 'conformity' and 'deviance' are phenomena which cannot be studied in isolation apart from the system which they refer to. It also implies that the meaning of conformity and deviance changes considerably between systems, and they can change drastically after changes of regimes.

Public law defines criteria for *legal* normality in behavior, and this must of course be distinguished from *statistical* normality. There are always certain individuals and groups who happen not to behave in accordance with the legal standards, and often the gaps may be considerable. The efficiency of the legal system seems namely to depend very much upon the consistency between the legal standards and what people in general consider as appropriate standards for everyday behavior: Beyond this, police forces as official upholders of law and order can be only marginally effective. Besides, their efficiency also depends upon their own loyality.

Conformity- and deviance-generating mechanisms must be considered to be constituted by complex human adaptations to external constraints like all other social processes, and we see little meaning in making separate studies of these fields. Provided that the model is adequatly formulated, these epiphenomena should be generated through the simulation.

Certain peculiarities could be indicated, however. Different people have typically differen alternative sets of action available in social behavior, and income and wealth are very crucial constraints which may restrict or widen the range of alternatives. So is the case also in this field; the wealty can much easier commit crimes which never become visible than the poor, and certain types of devi ance are more accepted if they occur in certain groups than in other ones (for example, to be an alcoholic).

Finally, we must maintain the distinction between *law* and *justice*; we shall not comment this intricate problem further here, however, mainly because it rather deserves fuller treatment in a separate monograph.

(Relevant literature: Merton 1968, Ch. VI and VII; Cohen 1961; Buckley 1967, p 166ff; Schwendter 1971.)

5. Epilogue: Homo Cyberneticus in Perspective

5.1. Sociocybernetics as a Social Science

In conclusion, we wish to look at the whole of *Homo Cyberneticus* in a time perspective and as a 'process of becoming'. Some twelve years ago, when we started this study, few people were able to connect a conception with the word "cybernetics", and "sociocybernetics" was still a tongue twister five years ago. Twelve years from now, we are sure, will most of the notions which we here have tried to elaborate, link, and make explicit, be parts of the fundamental conceptions of social scientists. Systemic and dynamic thinking has already become ubiquitous during the past decade, and not only among scientists. This development will surely continue; we have had it at our heels all the time.

This willingness to employ systems thinking can be deceptive, however, because it has hitherto not been able to bridge the gap between theory and practice. One has brainstormed and debated in vague systems terms, but detailed analyses have still had to resort to old-fashioned notions and theories. The most prominent systems-theoretical sociologist, Walter Buckley, has, as yet, only presented suggestions for, and fragments of, a cybernetic sociology (but we know through personal communication that he is working on a systematic design). Niklas Luhmann, to mention a European systems-theoretician, bases his investigations upon Parsonian conceptions; so does also Karl Deutsch, the most well-known political scientist of the systems-theoretical 'school'.

The crucial dividing line between 'orthodox' social science and sociocybernetics in our sense lies in

the approaches to coping with complexity. The 'orthodox' approach is to reduce the complexity of social reality to the interplay of a few variables, or to cut it into small and 'middle-range' pieces. The sociocybernetic approach implies the acceptance of complexity as an essential feature of what is to be depicted, and it seeks therefore to model complexity itself. It tries to link a multitude of small bits of information into a coherent whole, and it can in this attempt make some use of 'orthodox' detail-studies, but 'orthodox' theoretical studies can still contribute little to the practical assemblage of a total model. That is a reason why we have relatively few references to investigations in pure sociological theory. We believe also, paradoxically enough, that we in the future will obtain more relevant information from historical and ethnological studies than from sociological ones.

5.2. 'Bringing Man Back In'

The leading theme running through *Homo Cyberneticus* has been the conception of *man as a regulator* who seeks to control himself and his circumstances. To suggest such a conception is easy, but to explain *how* and *why* man behaves under various circumstances is more difficult. In order to be able to tackle these classical problems we have needed to reassemble man into a whole and to bring him back into sociology. We have tried to show that the gap between theory and practice, and between nomothetical and ideographical sciences, can be bridged.

5.3. An Integrating Approach

Homo Cybernetics cuts across traditional academic boundaries. Different types of complementary information can therefore be used for modelling purposes, and we can knit a finer net of constraints than ever before, in which subtler problems can be caught for scientific investigation, problems that hitherto have been scientifically intangible. Purely numerical and single-levelled analyses will never be able to let us grasp these, and we have therefore made efforts to develop instruments for non-numerical and multi-levelled simulation.

5.4. Homo Cyberneticus, Quo Vadis?

What we have presented as yet can in a long-term perspective only be regarded as fundamentals for a comprehensive simulation model of societies. Our own intention for the future is to finish the construction of such a model. The most immediate prerequisite for its implementation is at present the development and implementation of the Atman3 database design.

5.5. Postscript

After we finished our manuscript, we received a few books which we wish to mention because they had be been highly relevant for us if we had received them earlier. The most important of these are

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